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Essays on the Default of California Non-Rated Land Secured Bonds

Dissertation

Prague, November 2006

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Preface

This dissertation focuses on a specific area of local public finance, namely the performance of the non-rated land secured municipal bond market in California as comprised primarily of the Community Facilities District (CFD) bonds[1]. This market has become of growing importance but has not been widely studied until now. In this dissertation we analyze the performance and default experience of this market, examine its specific characteristics and determine the major factors contributing to the default of non-rated CFD bonds. The results we present provide important new information for assessing the credit quality of the California non-rated land secured municipal bond market and should be beneficial to investors for the better understanding and analysis of this market.

The dissertation consists of three essays[2]. The first essay builds upon existing default rate empirical studies of corporate and rated municipal bonds to examine for the first time the default experience of the non-rated land secured municipal bond market in California. The results we obtain demonstrate that the performance of this market is comparable to that of BB and B rated municipal bonds by Standard & Poor's, which implies that another look should be taken at the valuation of non-rated CFD bonds and the means of determining their credit risk to reflect their moderate likelihood of default.

[1] For a list of abbreviations, please refer to Appendix C of Chapter II.
[2] The composition of the data for the essays was the subject of considerable effort on our side and constitutes part of the originality of our research.

The second essay translates a real life case of a defaulted non-rated CFD and explores the situation of curing partial default and the potential conflict that might arise among the participants in such a district. We believe that the stylized model we build can provide useful insights to both the issuer of CFD bonds and the developers involved in a CFD on how to most efficiently structure workouts or settlements in order to cure the partially defaulted bond issue.

In the third essay we extend the research on the determinants of default occurrence among high yield corporate bonds to account for the non-rated CFD bonds in California. We refine the variables included in previous studies to reflect the specific nature of the non-rated CFD bonds and use the multinomial logit model to determine the relative importance of each of those factors on the change in the status of a CFD bond from "normal" to redeemed or defaulted. Our model incorporates the aging effect and various macroeconomic factors that affect the California non-rated land secured market.

This dissertation is mainly empirical and contributes to the literature in that it provides new insights on a growing municipal market segment that has been largely unexamined by existing default research. This study offers market participants and investors a better understanding of the underlying credit quality of non-rated CFD bonds. It also demonstrates the impacts of certain macro- and microeconomic factors in explaining the likelihood of non-rated land secured defaults and helps better assess the credit risk of non-rated CFD bonds.

Introduction and Review of the Existing Literature

1 Introduction

This thesis consists of three essays in the area of local public finance. It is mainly empirical and examines for the first time the default experience of the non-rated Community Facilities District (CFD) bond[1] market in California. The results we present provide important new information for assessing the credit quality of that market and help determine the major factors contributing to the default of non-rated CFD bonds. In the remaining part of this introductory chapter, we provide a brief overview of the local public finance in California and review the existing literature that pertains to all three essays.

2 Background

Finding mechanisms to finance public infrastructure has always been an essential need of local governments. Their inherent power of taxation has served as the traditional source of revenues used to fund public projects. California is no exception. One of the earliest means of financing public improvements and facilities in the State of California was the Improvement Bond Act of 1915 that enabled local governments to levy special assessments to finance improvements benefiting the land in a well-defined and limited area. General obligation bonds, which are backed by the full faith and credit of the issuer and the ability to levy *ad valorem* taxes, were another source of financing.

[1] Bonds secured by special taxes levied to finance public infrastructure in California. For more details related to this and other terms introduced in this chapter, please refer to Section II of Chapter II.

However, the approval of Proposition 13 in June 1978 reduced local property tax revenues, since it instituted a one-percent cap on property tax rates and rolled back property values for tax purposes to their 1975-1976 level. Furthermore, Proposition 13 limited annual increases in property tax bills to two percent and allowed reassessment only when property ownership changed. In addition, Proposition 13 required a two-thirds voter approval of state tax increases, thus making raising taxes more difficult and imposing restrictions on the taxing authority of local governments. In reality, Proposition 13 fundamentally changed the means of financing public services.

In her study "Guide to Public Debt Financing in California", Virginia L. Horler summaries the impact of the approval of Proposition 13 in 1978. She shows that financing volume in California decreased immediately after that. However, there was still need for building and maintaining public infrastructure. Consequently, the state and local governments sought alternative financing methods for funding capital improvements and started utilizing revenue bonds and leases with certificates of participation instead of general obligation bonds. Another financing instrument was provided by the passage of the Mello-Roos Community Facilities Act in California in 1982[2], which offered greater flexibility and allowed for the funding of a wider variety of improvements and services than earlier financing methods by enabling local agencies with taxing authority, with voter approval, to form a community facilities district, issue debt and levy a special tax.

[2] Mello-Roos Community Facilities Act of 1982, as amended, being Sections 53311 et seq. of the California Government Code.

Had Proposition 13 not passed, CFDs would most likely not have come into existence. Prior to the approval of Proposition 13, cities paid for new infrastructure through increases in property taxes. However, as we described earlier in this section, Proposition 13 limited the ability of local governments to increase property taxes and thus served as a catalyst for the emergence of the CFD bonds[3], which acted as an alternative instrument to fund local public improvements. The CFD bond market has since become of growing importance but has not been widely studied. In subsequent chapters we analyze the performance and default experience of that market, examine its specific characteristics and determine the major factors contributing to the default of CFD bonds.

3 Review of the Existing Literature

Default risk and credit quality have been the subject of numerous studies utilizing both actuarial and parametric methods. Altman and Saunders (1997) describe the research published over the past few decades on statistical models of debt default and loss. Gordy (2000) and Crouhy et al. (2000) discuss the advances in modeling credit risk and present a comparison of the variety of parametric models that have been developed and implemented by the financial institutions in assessing and managing portfolio risk. In their studies they show that those models are not utterly different from each other in terms of the approach to portfolio credit risk. Their research demonstrates that the differences in the obtained results among alternative parametric models are mainly due to

[3] Although Proposition 13 served as the catalyst for the introduction of the CFD bonds, its particular features do not interact with the community facilities districts (and the assessment districts) that we study in the next chapter. Proposition 13 applies to the regular *ad valorem* tax, while the special taxes and special assessments utilized in such districts are separate from the regular property taxes and lie outside the guidelines of Proposition 13.

the difference in the choice of functional forms and distributional assumptions. What these models have in common is the fact that they are primarily based on credit migration analysis, i.e. the likelihood of transitioning from one credit quality to another, including default, within a given time period.

Such studies describe default as the event in which an obligor fails to make a payment related to a loan or bond obligation, whether that refers to the payment of interest or the redemption of principal at maturity. Debt contracts maintain cross-default clauses in which "when the firm misses a single payment on a debt, it is declared in default on all of its obligations" (Grouhy et al., 2000). That is why many studies, both actuarial and parametric, view default as an absorbing state, i.e. once the issuer is in default, it stays in default.

The existing literature differentiates between technical default and monetary default. In their study, which is based on a performance analysis of public finance issuers' unenhanced[4] debt obligations and which demonstrates the default history and rating transitions[5] of the "traditional public finance market[6]", Woodell and Montrone (Standard & Poor's, 2004) define default as recorded "upon the first occurrence of monetary payment default on the relevant obligation." They argue that "technical defaults, such as covenant violations, are not payment defaults" and should thus be excluded from the

[4] I.e., "obligations not relying on external support provided by guaranties, outside support, or alternative revenue streams."
[5] Change in bond ratings of a particular issue, which is either being upgraded or downgraded throughout its life.
[6] As represented by entities such as cities, towns, school districts, and hospitals, as well as the bonds issued by them.

analysis. In their default analysis of Moody's-rated issuers in the US tax-exempt municipal market, Washburn et al. (Moody's, 2002) extend the definition of default to the event of missed or delayed debt service payment, when the bond obligor "ceded its authority to make debt payments to a third party that resulted in the suspension of payments to bondholders," or when "there was an exchange in which the bondholders accepted a package of securities that were deemed to be of diminished financial obligation." These definitions will be considered when characterizing default in this study.

Despite the numerous studies, most of the empirical work has focused on analyzing the default rate of a specific asset class: publicly traded corporate bonds that belong to one of the credit rating categories assigned by the credit agencies (Moody's, Standard & Poor's and Fitch). Hickman (1958), Altman and Nammacher (1985, 1987), Altman (1989), Asquith et al. (1989), Altman & Kishore (1998), etc. are some examples of such analyses. In these studies, the main factor of credit risk is the underlying assets' rating and "the associated expected and unexpected migration patterns" (Altman et al., 2000). Migration is defined as the change in credit quality from the initial base state, i.e. the upgrade or downgrade of a security from its original rating over a specified time horizon, with the "most important and costly negative migration" being to default.

Further studies have examined the default occurrence among private placements of bonds or insurance companies' investments (e.g., Carey, 1998), while others have traced the annual and cumulative default rates on rated municipal bonds. In 2000, Altman and

Suggitt published a mortality rate analysis that was the first assessment of the default rate of a credit asset class that, up to that point, had remained unexplored – commercial bank loans. There has been no prior empirical default analysis, however, of non-rated municipal bonds, especially, of a specific subset of non-rated bonds – the non-rated land-secured Mello-Roos bonds, which were introduced with the passage of the California Mello-Roos Community Facilities Act of 1982, and which have become of growing importance ever since.

In the default literature, numerous parametric studies have looked for an explanation of the fluctuations in default rates, trying to determine the major factors that contribute to the variation in default occurrence. Fons (1991), Helwege and Kleiman (1996), Jonsson and Fridson (1996), Jonsson, Fridson, and Zhong (1996), among others, developed statistical models which identified that default was influenced by three major factors: credit quality, the state of the economy, and the age of the bonds under investigation.

Fons' model included only two of these factors, credit quality and macroeconomic conditions, and found that over half of the variation in default rates over time could be explained using those factors. To model credit quality, Fons used the credit ratings of the bonds he studied, tracking the distribution of issuers within each rating category over time. He then multiplied that distribution by the historical average one-year default rate for each rating category and came up with the annual expected default rate for the high yield market. The Blue Chip consensus forecast of GNP growth at the start of the year was another explanatory variable in his model that served as a proxy for how default is impacted by macroeconomic effects. The results obtained by Fons showed that variation in default rates is negatively correlated with changes in the real GNP and positively correlated with changes in the fraction of lower rated bonds in the high yield market.

Later studies built upon Fons' model. Helwege and Kleiman (1996), for example, recognized that a few defaults occurred in the first few years after issuance and that defaults were, in fact, most likely to occur three years after the bonds have been issued. To account for that, their model incorporated the so-called "aging factor", which measured the impact of the length of time that risky bonds were outstanding on the default rate. The aging effect was modeled by adding an explanatory variable representing "the dollar amount of B3-rated issues outstanding lagged three years". In addition, the authors also suggested that default rates were not symmetrically affected by changes in macroeconomic factors. They argued that the effect of a decline in the GDP growth below a certain threshold would impact investment-grade bonds less than bonds from the speculative-grade category. In order to measure that effect, Helwege and Kleiman added a recession indicator variable that equaled one if GDP growth was equal to or fell below 1.5%. They further formed an interaction variable by multiplying the recession indicator variable by the expected default rate (as measured in the Fons model). Using the newly formed interaction variable, Helwege and Kleiman showed that a high fraction of lower rated bonds issued in the high yield market is more likely to lead to an increase in default rates in the case of an economic downturn than the "distribution of higher tier speculative grade credits."

Jonsson and Fridson (1996) and Jonsson, Fridson, and Zhong (1996) further extended the Fons model by developing a statistical framework similar to that of Helwege and Kleiman. They, too, studied the three major factors influencing default: credit quality, the state of the economy, and the aging effect. The independent variables in their models were able to explain almost 87% of the variation in the annual default rates of Moody's speculative-grade bonds. Jonsson and Fridson's model combined two factors in one variable, "the fraction of high yield bond issuance rated B3 or lower by Moody's lagged by three years", which measured simultaneously the aging effect[7] and the credit quality[8]. In addition, the authors used different proxies for the macroeconomic effects that were "more closely tied to the financial health of corporations" and thus had greater explanatory power – corporate profits and the liabilities of failed businesses. Jonsson, Fridson, and Zhong (1996), on the other hand, further extended these models by including variables[9] which attempted to "assess the investor optimism in the market" and "the accessibility of the equity markets as alternative or supplemental sources of financing for risky borrowers," rather than measure the state of the economy. Their study showed that default rates were inversely related to successful IPOs and high price-to-earnings ratios.

However, all these studies analyzed the fluctuations in the default rates and occurrence of corporate bonds. There has been no prior statistical analysis of the non-rated land-secured Mello-Roos bonds (CFD bonds) issued in California.

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[7] As represented by the lag.
[8] As measured by the fraction of low rated bonds.
[9] Those variables included the NASDAQ price-to-earnings ratio, the Standard & Poor's price-to-earnings ratio, the difference between the S&P price-to-earnings ratio and the NASDAQ price-to-earnings ratio, and gross proceeds of initial public offerings (IPOs).

Our study is organized as follows. In Chapter Two, we analyze for the first time the default experience of the non rated land-secured market in California for the period 1985-2005. In Chapter Three we construct a stylized model of *curing* a Community Facilities District's default, and in Chapter Four we examine the factors affecting the default occurrence of the Mello-Roos bonds and build upon previously existing models by refining the variables they use to reflect the characteristics of the non-rated land-secured market in California.

A Default Study of the Non-Rated Land Secured Market in California (The Default Experience of Mello-Roos and Assessment District Bonds)

Abstract

While default rate empirical studies of corporate and rated municipal bonds are now commonplace there has never been a study of the default experience of the non-rated land secured market in California, which has lately become of growing importance. This paper examines for the first time the default experience of that market during the period 1985-2005 and shows that its performance is comparable to that of BB and B rated municipal bonds. The results of our study provide important new information for assessing the default risk of the California non-rated land secured market and provide market participants and investors with better understanding of the underlying credit quality of that market.

Keywords: default, municipal bonds, CFD, AD, Mello-Roos, land secured market
JEL classification: A10, D53, H74

1 Introduction

Municipal debt is generally considered as bearing low risk compared to corporate debt but credit risk varies depending on the municipal sector. For a long time there has been a perception in the municipal bond market that the Mello-Roos and Assessment District bonds[1] sold on that market bear high risk, but while most of the prior empirical work has concentrated on corporate or rated municipal bonds, there has not yet been a study of the default risk of the non-rated land secured market. This has potentially resulted in the under-pricing of such securities as a result of the implied weakness in their credit quality. In 1997, the California Debt and Investment Advisory Commission[2] wrote that for the entire 1982-1997 period, the average rate of default for Mello-Roos bonds was probably around 5% and argued that this rate was high compared to any capital market or sector. The Commission further reported that various research studies had shown the default rate for the entire municipal market to be at less than 1%, and the default rate for the corporate securities market, which is highly regulated, to be at about 2%.

This paper for the first time looks at data that allows a comprehensive study of the non-rated land secured market. This market has lately become of growing importance, especially in California, after the introduction of the Mello-Roos Community Facilities Act of 1982[3]. In this study, we estimate the marginal and cumulative default rates for Mello-Roos and Assessment District bonds that were issued in California from 1985 to 2004, as well as for the entire non-rated land secured municipal market comprised of

[1] Bonds secured by special taxes or assessments levied to finance public infrastructure in California. For more details please refer to Section II.

[2] "Debt Line", November 1997

[3] Mello-Roos Community Facilities Act of 1982, as amended, being Sections 53311 et seq. of the California Government Code.

those bonds. Default estimates are based on a total sample of 1,230 CFD bond issues totaling $14,676 million and 2,307 AD bond issues totaling $12,415 million. For the data samples we have utilized Altman's mortality rate methodology. The results obtained from this analysis are further used to determine the historical default rates of the non-rated Mello-Roos and Assessment District bonds in our sample and find out whether, in accord with the municipal bond market perception, they do indeed show significantly high default rates. As a next step, the performance of these bonds is compared to that of other municipal bonds from various rating classes, where we show that it, in fact, is comparable to the performance of BB and B rated U.S. municipal bonds. The results of this study provide an important contribution to the proper assessment of the credit risk associated with Mello-Roos and Assessment District bonds and the overall credit quality of the non-rated land-secured market in California.

2 Background

2.1 Assessment District and Mello-Roos Bond Financing

The approval of the Improvement Act of 1911, the Municipal Improvement Act of 1913, and the Improvement Bond Act of 1915 provided local agencies with a means of financing public infrastructure. This legislation enabled local governments to levy special assessments and form special financing districts, called assessment districts (AD), that include property that would receive direct benefit from the construction of new public improvements. The most common types of public infrastructure financed by those districts include streets, curbs, gutters, water or sewer systems, etc. To fund such projects assessments are levied on all the properties in an assessment district in proportion to the benefit derived from the improvements. Bonds are then sold and repaid from the special assessments received. While individual 1911 Act bonds are payable from the assessments on one specific property only, 1915 Act bonds are payable from all assessments collected.

Assessment District financing was one way of funding public infrastructure. As discussed in the Introductory Chapter, however, in June 1978, California voters enacted Proposition 13. Proposition 13 reduced local property tax revenues by more than 50% by introducing a 1% cap on property tax rates and rolling back property values for tax purposes to their 1975-1976 level. Reassessment was allowed generally only when property changed ownership and annual increases in property tax bills were capped at 2%. Increasing state taxes were required to receive 2/3 legislature approval and the taxing authority of local governments became more restricted. These factors made raising taxes more difficult and limited the ability of local governments to fund public infrastructure. There was a need for a new funding mechanism that provided greater flexibility and addressed the growing demand for financing public improvements.

Proposition 13 served as the catalyst for the introduction of such alternative. The necessary flexibility was provided by the passage of the Mello-Roos Community Facilities Act in California in 1982 (The Act), which offered an alternative vehicle for financing capital improvements. The Act allowed the funding of the construction or acquisition of real or tangible property with a useful life of five years or more, such as streets, sewers, etc. It also allowed schools, police and fire services, as well as other services to be financed to accommodate the growing needs of developing areas. The Act provided greater flexibility and allowed for the funding of a wider variety of improvements and services than earlier financing methods.

Under the Mello-Roos Act, local government agencies with taxing authority may, with voter approval, form a community facilities district (CFD), issue debt and levy a special tax. The local jurisdiction's legislative body forms a community facilities district with boundaries to include property that will derive benefit from the improvements that are proposed to be financed. In most cases, the improvements will be financed by the issuance of bonds. The bonds are then repaid by a special tax levied annually and collected on the annual property tax bill for each parcel within the CFD. In order to levy special tax, the Constitution of the State of California requires a two-thirds voter approval to authorize the CFD, the bonded indebtedness and the annual special tax levy. If there are less than twelve registered voters living in the CFD, a landowner vote is held, allowing each property owner one vote for each acre of land owned. The special tax then becomes a continuing lien against the property and may be levied for up to 40 years to repay the bonds issued. Some CFDs do not issue bonds but use the special tax instead to directly fund services on a pay-as-you-go basis. Please refer to Exhibit A for an illustration of the initiation and formation process of a CFD.[4]

2.2 Special Tax Levy under the Mello-Roos Bond Act

Mello-Roos bonds are secured by special tax revenues on the property for which such Bonds are being issued. Special tax revenues are the proceeds of the special taxes levied

[4] In addition, Exhibit B provides a comparison between CFDs and 1915 Act Assessment Districts.

in each fiscal year on each taxable property within the CFD as determined by the Rate and Method of Apportionment (RMA), or special tax formula, of the CFD. Typically, the special tax formula classifies the property within the CFD as either "developed" or "undeveloped" according to the occurrence of certain events: the issuance of a building permit, recordation of a final map or the issuance of a certificate of occupancy. Once property is classified, the aggregate special tax is apportioned to each parcel. Generally, developed property is taxed first, up to a certain percentage of its maximum special tax. Then, to the extent that sufficient revenue cannot be generated from developed property, undeveloped property is taxed as necessary up to its maximum special tax amount. The amount of special taxes that is collected each year is generally defined as the amount sufficient to pay the administrative expenses for the CFD, the regularly scheduled debt service payments for that year (including principal and interest payments), any amount required to replenish any reserve fund established in connection with the bonds, any reasonably anticipated delinquent special taxes for the previous fiscal year, and any remarketing costs and credit enhancement and liquidity fees. Thus, special taxes are levied in an amount that is sufficient to pay administrative expenses and provide special tax revenues in an amount equal to 110% of maximum annual debt service on the outstanding bonds. This 110% coverage serves as a cushion against unexpected failure to collect all taxes due to make the debt service payments on the bonds. Special assessments, on the other hand, may only be levied in an amount equal to up to 100% of the pro rata share of the bonds.

Special taxes, as well as special assessments, are collected in the same manner and at the same time as ordinary *ad valorem* property taxes. Special taxes have the same priority and bear the same proportionate penalties and interest after delinquency as do the *ad valorem* taxes on interests in real property. Generally, for CFDs, *ad* valorem and special taxes do not exceed two percent of the property value. They are generally levied based on their assigned rate but, in cases of delinquency in the tax payment of some properties, the tax levy can be increased to its maximum level, as set in the RMA.

Although the maximum special tax generates sufficient revenue to meet or exceed debt service payment, in cases when debt service payments increase on an annual basis, the maximum special tax may need to escalate[5]. In order to have an increased capacity to cover potential delinquencies, some CFDs may choose to have special tax escalators even though their debt service payments do not increase. The typical maximum special tax escalator is 2% but some CFDs may have different escalation rates.[6] Under no circumstances, however, can the special taxes on one property be increased as a consequence of delinquency or default by the owner of another property by more than ten percent per fiscal year.

2.3 Reserve Fund

Upon the issuance of the Mello-Roos bonds and assessment district bonds, a debt service reserve fund (DSRF) is created and established in an amount equal to the reserve requirement. This fund is required by the market to help protect the bond holders in the

[5] In contrast, special assessments are fixed for the life of the bonds.
[6] Modifications to Section 53321 of the Government Code relating to the special tax set limit on the annual escalation of the maximum special tax, depending on the type of property. Per that amendment, the annual escalation rate of the maximum special tax on residential property cannot exceed 2% (unless the CFD was formed by a vote of registered voters.) In addition, the actual special tax levy may be less than the maximum in a given year and may increase in future years.

event of delinquency. DSRF also protects the issuer of the bonds. In cases of insufficient special tax or special assessment revenues due to missed or delayed payments, money from the DSRF is drawn upon to make the debt service payment due and to avoid default on the bonds. The reserve requirement for this fund is limited per Federal Tax Law, as of any date of calculation, as no more than the lesser of three tests, i.e. the lesser of (i) 10% of the outstanding principal amount of the bonds, (ii) maximum annual debt service on the outstanding bonds, or (iii) 125% of average annual debt service on the outstanding bonds. As specified earlier, all amounts deposited in the DSRF can be used and withdrawn solely in the event of any deficiency of the amount required for the payment of principal and interest and any premium on the bonds (or for the purpose of redeeming all bonds, if adequate to do so).

To reduce the risk of delinquency of special taxes, some jurisdictions may require an additional form of security for the bonds when the concentration of ownership in the district is high, but this varies from jurisdiction to jurisdiction. Depending on the Local Goals and Policies of the issuer, lack of diversification of ownership is observed when a developer or property owner owns more than a certain percentage of the property within the district[7] and is thus responsible for a significant portion of the special tax levied in the district. In such cases, the developer is required to provide a letter of credit (LOC) from a bank satisfactory to the district in an amount that varies from CFD to CFD but is generally calculated based on the gross debt service on the bonds for a certain period. For example, the LOC amount may be equal to the gross debt service on the bonds for the

[7] For some CFDs that means 25% or more, for others that is 30% or more, while yet for others, that limit can be 33% or more of the property within the district.

current and coming fiscal year (the stated amount), or to one year's worth of debt service on the bonds, etc. In the event of delinquency in the special taxes owed by such developer, the amount in the LOC is reduced by the amount of the delinquent taxes due. Such amount is used to replenish the DSRF, from which a withdrawal was made to make the scheduled debt service payments. After each withdrawal, the stated amount in the LOC is reinstated until the LOC can be terminated. Such termination occurs on the date which is the earliest of: (i) a specified date a year or two years from the date of issuance of the bonds; (ii) the date on which the stated amount is permanently reduced to zero pursuant to drawing(s) under the LOC or (iii) the date upon which the developer owns less than that specified percentage of the property within the district.[8] Assessment districts often have similar requirements for the posting of additional form of security in cases of high concentration of ownership.

2.4 Events of Default

For each AD and CFD, the issuance and sale of bonds is authorized by a Resolution of Issuance (ROI). In some cases, after the bonds are issued, and in spite of all funds and reserves set aside to secure the timely payment of the debt service on those bonds, there are instances of default occurrence. Default occurs when there is a missed payment of principal or interest on any bond that is due or payable.

As described in the earlier sections, in the case of delinquent assessments and special taxes and insufficient revenue to pay debt service on the bonds, there is a draw on the

[8] However, the exact triggers for the termination of the LOC vary among CFDs.

DSRF in an amount equal to the debt service payment deficit due. The DSRF is then replenished by either a transfer from the LOC (if any is required) or from the delayed payment of assessments or special taxes. Under this scenario, all payments of principal and interest on the bonds have been made on a timely basis (thanks to the balance in the DSRF) and there has been no default. If however, the assessments or special taxes are delinquent for a longer period and there is no replenishment of the DSRF, such reserve fund will be depleted and there will be insufficient money available to pay the principal and interest due on the bonds. Thus, by definition, default occurs when there is a failure to make the scheduled debt service payment due on the bonds. If the assessments or taxes owed are paid subsequent to that default date, along with all penalty and interest, there can be sufficient revenue to reinstitute the punctual payment of debt service on the bonds and cure the default[9]. However, if that is not the case, the district remains in default until foreclosure action is taken against the delinquent property and such property is sold at a judicial foreclosure sale or until a workout has been reached that brings current all assessments or special taxes owed.

2.5 Foreclosure of Delinquent Property

In the event of a delinquency in the payment of any installment of assessments or special taxes, the district may be obligated to order, commence and diligently prosecute to

[9] Thus curing a CFD or AD bond default is very different from curing a corporate bond default. If there are delinquencies associated with a CFD or AD bonds, all that is needed to make the bonds current and cure the default is to make the missed payments. There is no acceleration clause for the entire amount of debt. With corporate bonds, on the other hand, very often if one payment is missed, the entire amount of debt can become due and payable, which can make the curing of the default more challenging.

judgment an action in the superior court to foreclose the lien of any assessment or special tax or installment of assessment or special tax.

The exact timing of foreclosure action and the delinquent amounts that trigger foreclosure vary depending on the provisions of the Indenture (or Fiscal Agent Agreement) of a particular AD or CFD. The following is an illustration of such indenture provisions. One business day after each interest payment date, the amount of special taxes levied in the district is compared to the received amount of special tax revenues. If the received amount is less than 95% of the levied amount, delinquent owners are notified within 45 days and required to pay their delinquency immediately. If the delinquency remains uncured, foreclosure proceedings are undertaken within 90 days against each delinquent parcel of land within the district. Foreclosure is also commenced if any single parcel that is subject to the special tax in the CFD is delinquent in the payment of special taxes in the aggregate amount of $1,000 or more[10]. Once the delinquency has been determined, a notification is again sent within 45 days to the delinquent property owner and if the delinquency remains uncured, foreclosure proceedings are commenced within 90 days.[11] If the reserve fund is depleted, there could be a default or delay in the payment to the owners of the bonds pending prosecution of foreclosure proceedings and receipt by the district of foreclosure sale proceeds.

Any parcel that is subject to foreclosure sale must be sold at the minimum bid price (equal to the sum of delinquent tax installments, penalties, interest, attorney's fees and

[10] Again, exact amounts vary among CFDs.
[11] Similarly, for ADs, bondholders have the right to foreclose on property when taxes are delinquent for a certain period (usually 90 to 180 days). Penalties and collection costs must be paid by the delinquent property owner.

costs of collection and sale) unless a lesser minimum bid price is authorized by the owners of 75% of the principal amount of the bonds outstanding. Although a judicial foreclosure action can be commenced, there is no assurance that it will be completed or that it will be completed in a timely manner. In many cases, such foreclosure sales have been going on for years before being completed.[12]

3 Methodology

The existing literature on municipal and corporate bond defaults describes three major methodologies for assessing the default rates of the analyzed securities. These methodologies have become widely used in the industry and will be the subject of discussion in this section.

3.1 Static Pool Methodology

The Static Pool Methodology is a common tool for the credit analysis of rated municipal bonds. Woodell and Montrone's study (Standard & Poor's, 2004) tracks the rating history of outstanding debt issues and uses this methodology to analyze the rating transitions and the default history of those transactions. To avoid magnitude skewing of the results, the authors use individual issuances, rather than dollar amounts of issued debt. Since defaults are less likely to occur in the first few years of an issue and because results might be distorted if the number of issuance increases over the specified period, for which default

[12] A recent tendency for many CFDs is the move toward a requirement for the developer(s) within a district to post LOC as an additional form of security for the bonds. However, it is unclear how much that move has helped, especially given the inability to effectively utilize the foreclosure process in the case of default. That inability is reflected in the very long time it takes to complete that process from the start of the foreclosure action to the actual sale of the property.

rates are calculated as the ratio between the number of defaults and the number of outstanding issues, the study creates the so-called “static pools”. A static pool is constructed at the beginning of each year covered by the study and tracked from that point on. All ratings included in the study are sorted into these pools, which are called static because the denominator (i.e., the ratings included in the pool) remains constant over time. Woodell and Montrone note that all ratings are tracked annually within each pool and that this process necessitates the comparison of each rating on the first and last day of each calendar year under investigation. Thus, rating changes within the year are not reflected; only beginning and end-of-year ratings are reflected. This implies that if the static pool in year t is comprised of all debt outstanding as of the beginning of that year, then the static pool associated with year t+1 is formed by adding new ratings first rated in year t to the still outstanding ratings of the year t static pool and subtracting those ratings that defaulted or were downgraded to non-rated. Annual default rates are further calculated for each static pool based on number of issuers in each rating category. Cumulative default rates are then estimated that average the experience of all static pools. This is achieved by calculating marginal default rates, conditional on survival (i.e., on no-defaulters) for each time horizon and each static pool. The conditional marginal default rates are then weight-averaged to obtain the average conditional marginal default rates. Conditional default rates are calculated by finding the ratio between the number of defaulted issuers in a static pool at a specific time horizon and the number of issuers that did not default until that point in time. Weights are based on the number of issuers in each static pool. Cumulative default rates equal one minus the product of the proportion of survivors (non-defaulted issuers).

Although valid, this methodology focuses primarily on the stability of rating classes over time, demonstrating that public finance ratings are very stable, especially for the highest rated categories. Across the analyzed sectors, the authors show the existence of an overall trend that “ratings and credit volatility increases at the lower end of the rating scale.” As one might intuitively expect, this study confirms that “the higher the rating the lower the historical average of default, and vice versa.” The obtained results show that over each time span, lower ratings are associated with higher default rates.

3.2 The Cohort Approach

An alternative approach for assessing default risk of municipal bonds has been utilized by Washburn et al. in their “Moody’s US Municipal Bond Rating Study” (2002). The database used for that study contains only issuers rated by Moody’s and spans the period 1970 through 2000. The authors calculate default rates, as in a prior corporate bond default study, by taking a fraction in which the numerator represents the number of municipal debt issuers that defaulted on Moody’s-rated debt over a particular period of time and the denominator represents the number of municipal issuers that could have defaulted over that time period. As of January each year, the authors construct cohorts of all municipal issuers at each rating level. Further on, in order to calculate one- and multi-year default rates, they track the subsequent incidence of default for issuers of each rating level and from each cohort on through to the end of the sample period.

The default rates for Moody’s-rated municipal issuers calculated in this study prove to be quite low. The authors report that since 1970, the one-year, issuer-weighted average annual default rate for all Moody's-rated municipal bond issuers, regardless of their credit rating, is 0.0043%. When a differentiation is made between investment vs. speculative grade bonds, as one would expect, the investment grade sector demonstrates extremely low default rates, 0.0005%, while much higher default rates are observed in the speculative-grade sector (0.3914%). The authors argue that one explanation of the extremely low default rate among municipal issuers is the highly skewed distribution of ratings over that time period toward investment grade. Over 90% of all initial municipal ratings in the analysis are investment grade, and nearly 70% are rated single A or higher.

Notwithstanding the fact that this cohort approach provides another tool for calculating default rates, the 2002 study analyzed only Moody's-rated municipal bonds. The authors recognize that there is significant credit risk among many non-rated issuers and that while there were only 18 defaults on Moody's-rated issuers between 1970 and 2000, that number was substantially higher for unrated issues during that same time horizon.

The cohort approach has been applied in other empirical studies as well. Litvack and McDermott (2003) utilize the methodology in their municipal default risk study. In it they calculate default rates by analyzing the performance of bonds issued in a given year (a cohort) over time. Default rates are based on the dollar amount of defaulted par or number of defaulted issues compared to issuance volume during that period. Recognizing the fact that a large dollar default can skew the results if default is calculated based on dollar volume, as can a default by a single entity with a large number of outstanding issues (provided that default rate is assessed based on number of issues), the authors present default rates based on both methodologies where appropriate. The database they use covers defaults that occurred from January 1, 1980 to October 31, 2002 and pertains to all types of municipal bonds issued in the U.S. over that period. Cumulative default rates are further calculated in their paper by industry sector.

The study finds that overall default rate is low relative to many fixed-income sectors, with default rates varying substantially across municipal subsectors. It provides meaningful analysis of the default occurrence among both rated and non-rated municipal bonds but still applies a general approach and does not examine the default risk of non-rated land secured municipal bonds.

3.3 Default/mortality rate methodology

Another approach for estimating the default rate of certain securities is Altman's mortality rate concept. Altman (1989) argues that default rates for individual periods, annually, for example, are measured on the basis of defaults in the period compared to some base population in that same period. He bases his default estimates on both number of issues and dollar amount. In his study "Measuring Corporate Bond Mortality and Performance", he applies the methodology to a specific cohort group, such as a bond-rating category and tracks that group's performance over a period of time. However, his technique can easily be applied to a wider variety of securities. In fact, in Altman et al. (2000), he uses that same method to estimate the default rate on large, syndicated commercial loans, where he also aggregates all defaults into major rating categories. To account for the fact that the original population can undergo changes over time as a result of various events, Altman considers mortalities in relation to a survival population and then inputs the defaults to calculate mortality rates. He calculates the marginal and cumulative mortality rates for the securities under investigation.

The resulting mortality rate is "a value-weighted rate for the particular year after issuance, rather than an unweighted average." This weighted-average technique correctly biases the results toward the larger-issue years, especially the more recent years, rather than improperly affecting the average, which would otherwise occur if, for example, the amount of new issues were very small as compared to high defaults in that same year. This is one of the differentiating features of Altman's model versus other default models.

Another major difference is the fact that this actuarial-based technique allows for the adjustment in the size of the original population as time goes by and some securities default, get called, mature, or are redeemed. The fact that a special group with particular original characteristics is tracked over relevant time periods after issuance allows to assess the aging effect as of the time of origination. This technique is consistent with actuarial theory but differs from the static and cohort approaches for estimating bond defaults discussed in the earlier sections, which measure default as of certain initial date regardless of the age of the bond. That is why the mortality rate methodology is often considered superior and will be used in this paper for calculating the default rate of the non-rated Mello-Roos bonds.

In order to calculate the default rate on the sample of Mello-Roos bonds issued from 1985 through 2004, we apply Altman's mortality rate concept (see Altman 1989, for example). Default rates are based on dollar amount and number of issues[13] where appropriate. The marginal mortality rate (MMR) for each year is obtained as follows:

$$MMR_{(t)} = \frac{\text{Issue Number (Dollar Amount) of Bonds Defaulting in year (t)}}{\text{Issue Number (Dollar Amount) of Bonds at the start of year (t)}}$$

To calculate the cumulative mortality rate (CMR) over a specific period of time (such as 1, 2, 3, …, T years) we subtract from one (1.0) the product of the surviving populations of bonds of each of the previous years:

$CMR_{(T)} = 1 - \prod_{t=1}^{T} SR_t$, where $CMR_{(T)} =$ Cumulative mortality rate in (T), and

$SR_{(t)} =$ Survival rate in (t); $1 - MMR_{(t)}$.

We then compare the obtained mortality rates with the mortality rates for assessment district bonds as well as with other municipal bonds' mortality rates over the same sample period.

4 Sample Data

It was extremely difficult to track the issuance and default information available for both AD and CFD bonds to be able to construct a complete data set, especially for the years prior to 1993. This was due to a number of reasons. First, some CFDs have been issued as part of Marks Roos pools under a specific, two-tier, structure. The first tier is at the authority level under which bonds are issued as revenue bonds, while the second tier is

[13] Note that in this analysis, number of issues is assumed to be the same as number of issuers, since each bond issue represents a separate transaction and can thus be counted as a separate issuer.

comprised of all local obligations of the underlying CFDs that support those revenue bonds. Given the structure, such issues are generally reported as revenue bonds under the issuing public financing authority (PFA) without any mention of the underlying CFDs at the local level. Only in certain circumstances were we able to separate the underlying CFD issues and include them in our data set. Another difficulty was presented by the fact that although rare, in some cases CFDs have been issued as private placements and information for them is not readily available. Last but not least, prior to 1993, the obligation for annual disclosure for CFD bonds was not easily enforceable and there might be a possibility that a few CFD issues that actually defaulted were not reported and were consequently excluded from the data set. However, those defaults, if uncured, would have been captured at a later date and would thus have ultimately been included in the data set. Furthermore, with the legislation enacted in 1992 (Chapter 772, Statutes of 1992), all issuers of CFD bonds are required to report annually to the California Debt and Investment Advisory Commission (CDIAC) on the fiscal status of their bonds sold after January 1, 1993 until such bonds are retired, so we believe that the information we have collected is as extensive as possible, given the limitations previously described. This, however, was not the case with AD bonds. Compiling a default list for those bonds was extremely difficult due to the fact that there is no disclosure requirement associated with them like there is for Mello-Roos bonds.

Thus, considerable effort on our part went into the composition of the sample data, which constitutes part of the originality of our research. The data sets we use have been compiled from a variety of sources: CDIAC, Fieldman, Rolapp & Associates, California Tax Data, Income Securities Advisors, Inc., Securities Data, the Bond Buyer, the

Municipal Bond Advisor, and numerous industry professionals such as trustee banks, underwriting and bond counsel firms, etc. They provide information on both aggregate bond issuance and default occurrences. Generally, the information received included issuer name, project name, issuance date, default date, principal amount, maturity date, Cusip number, CDIAC number, and other pertinent information, such as redemption or refunding date. In order to obtain the final data used for this study, we filter the compiled data sets on three different levels to eliminate duplicates and records that do not belong to the group of CFD or AD issues. Data is organized by calendar year.

The issuance data set includes all CFDs and ADs whose issuance was reported to CDIAC and classified as Mello-Roos and Assessment District type of financing. Further, we include some issues that are part of revenue bond pooled financings but for which we have determined that they do in fact represent special tax obligations. Since those are at times hard to distinguish or are often only partially based on special taxes, our list includes only the ones that are clearly classifiable as CFD bonds.

The default data is also grouped by calendar year. It has been examined as well to eliminate duplicates and possible misclassifications. Each defaulted transaction is counted only once, at the first time of default occurrence. Thus, if a bond issue defaulted three times, for example, it will be listed only once in our data set, at the first time of default. This is consistent with the methodology used in existing default studies.

As mentioned in the previous section, in applying Altman's mortality rate methodology, we adjust the size of the original population as time goes by to account for bond calls, maturities, redemptions and defaults. Since “good” CFD bonds (i.e., those for which projects are developed, built and occupied faster) are more creditworthy, they are able to be called and refunded as rated bonds. At that point they exit our sample of non-rated bonds. “Bad” CFD bonds (i.e. those whose projects do not get developed or experience many problems and take longer to get built and occupied) on the other hand, prove to be riskier and do not convert to rated bonds. They remain in our sample and thus, over time, among any issuing cohort, the fraction of “bad” bonds increases, which leads to higher default rates. Keeping that in mind, the default rate for non-rated land secured bonds might actually be lower than we show in that the number of non-rated land secured bonds is reduced over time[14].

5 Land Secured Bond Issuance: 1985-2004

The issuance data we have compiled provides information on both number and dollar amount of CFD and AD bonds issued during the twenty-year period under investigation. The total number of CFDs issued in our sample is 1,230, while the total number of ADs issued is 2,307. Figure I illustrates the number and par amount of Mello-Roos bonds issued for the period 1985 through 2004, while Figure II illustrates the number and par amount of Assessment District bonds issued during the same period.

[14] Thus, our study provides the most conservative approach on calculating non-rated land secured bond defaults (i.e., the worst case scenario) and as such might result in higher default rates for such bonds.

FIGURE I: MELLO-ROOS BONDS ISSUANCE: 1985 TO 2004

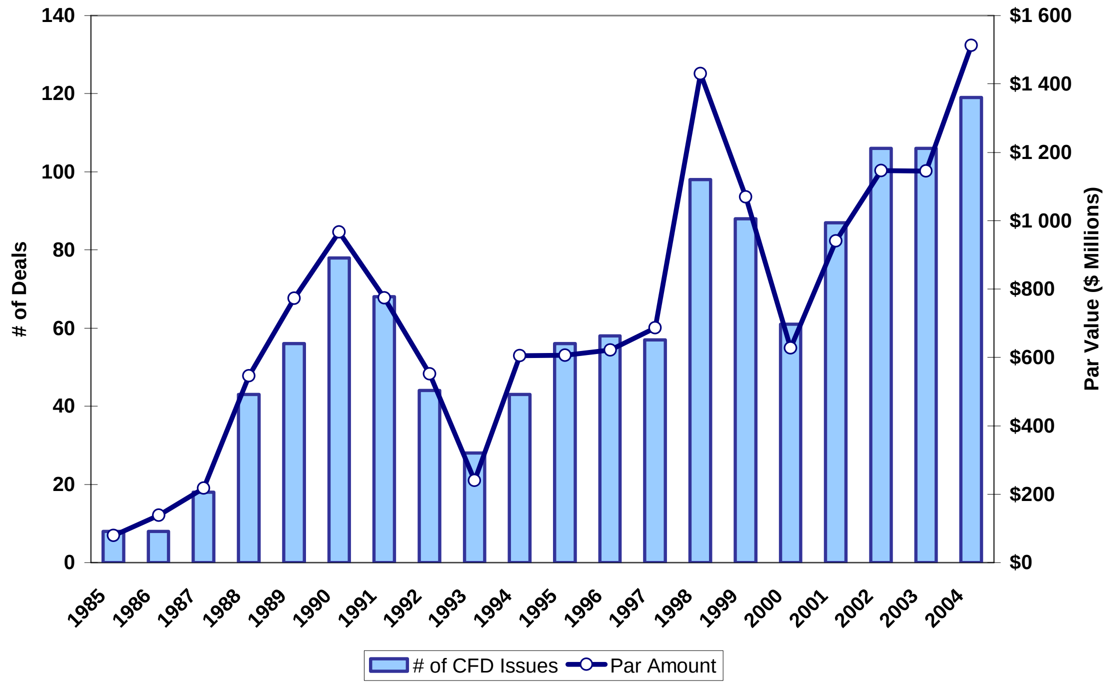
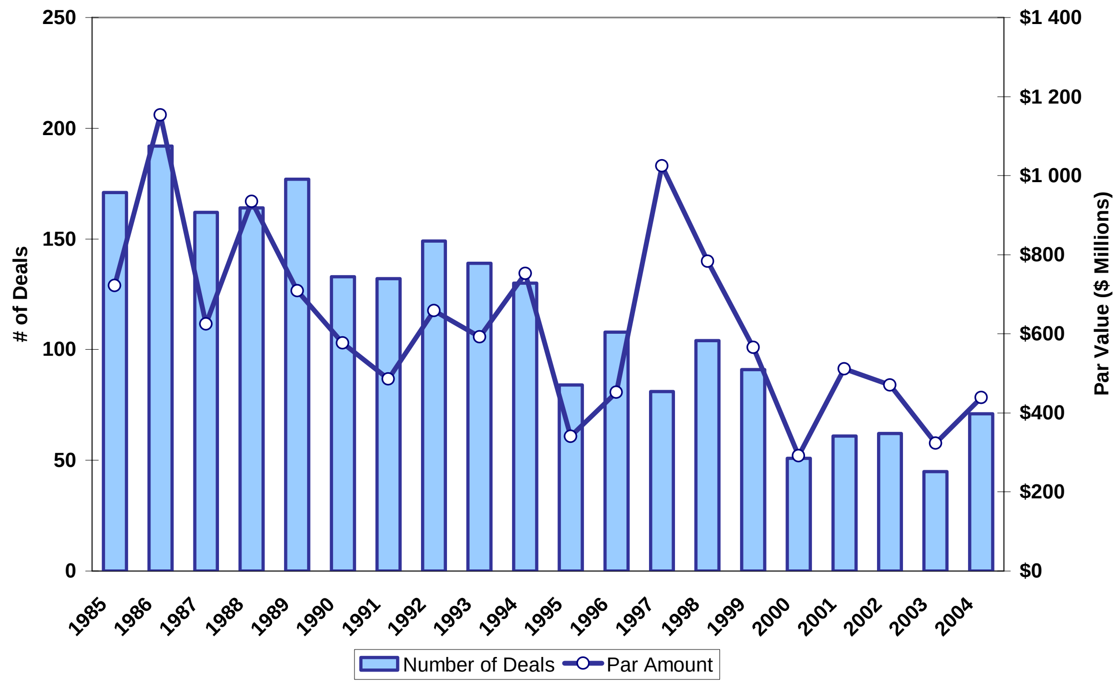
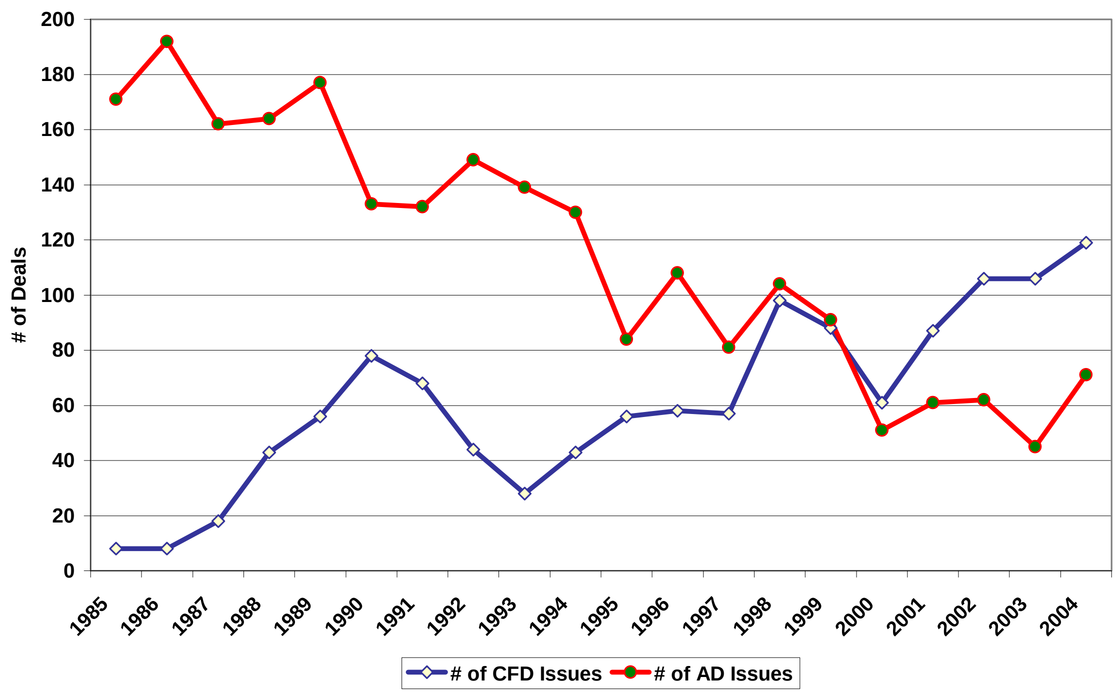


FIGURE II: ASSESSMENT DISTRICT BONDS ISSUANCE: 1985 TO 2004



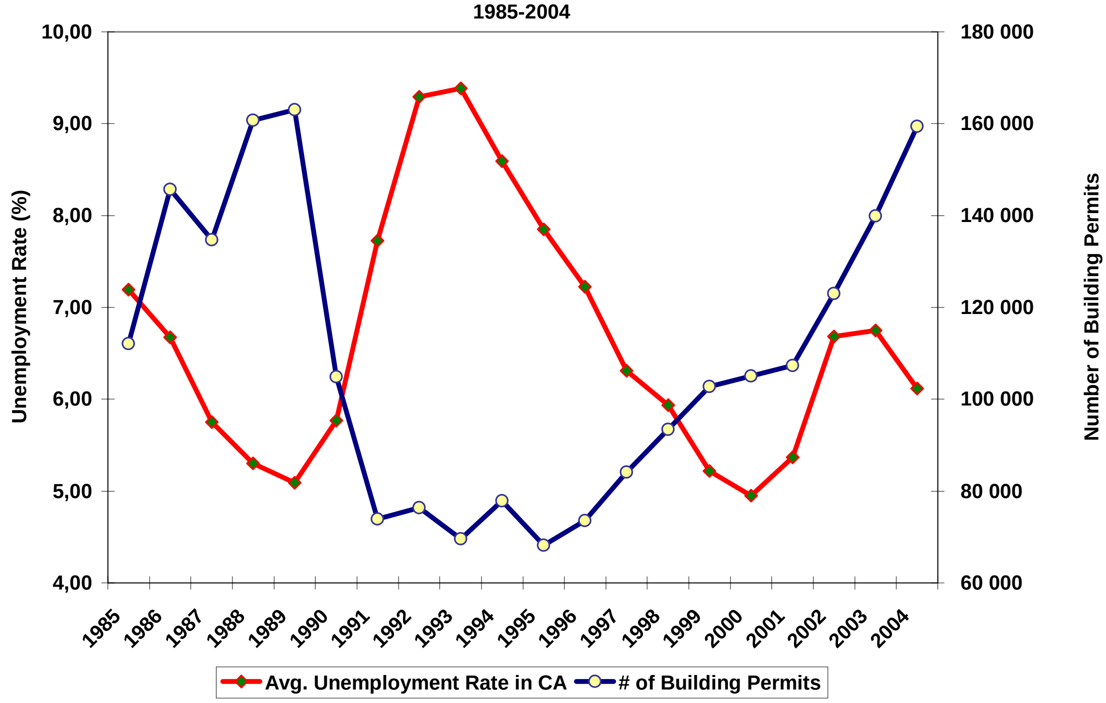
As can be seen from these figures, as well as from Figure III, AD bonds were issued in greater amounts and more often during the period 1985 through 1993 when Mello-Roos bonds were still new. However, starting in the early 1990's the use of CFD bonds as a financing mechanism grew, especially after 1993 when state law changed and CDIAC's annual reporting requirement was instituted. As a comparison, the AD bond transactions from 1985 through 1992 averaged 160 issues, while the average CFD bond issuance averaged only 40 transactions. However, over the next six years, from 1993 through 1999, the issuance of CFD bonds increased by 51%, while AD issuance decreased by 34% over the same period.

FIGURE III: NUMBER OF CFD VS. AD BONDS ISSUED: 1985 TO 2004



In spite of the difference in the average issuance between the Mello-Roos and Assessment District bonds, the mid to late 1980's were a period in which the issuance of land secured bonds was strong, as demonstrated by Figures I & II, and AD and CFD bonds were often used as a mechanism to fund public infrastructure. This was a period of strong economy and rapid development as illustrated by Figure IV. During that period the unemployment rate fell from its high of 7.2% in 1985 to 5.1% in 1989 and the number of employed increased by 14.4%. Furthermore, building permit issuance increased by 45% from 112,089 in 1985 to 162,981 in 1989. At the same time, the electronics and computer industries were growing stronger and California had become the leading state in terms of high technology industries.

FIGURE IV: AVERAGE UNEMPLOYMENT RATE VS. BUILDING PERMIT ISSUANCE IN CA: 1985-2004



The economic outlook changed significantly, however, in 1990-1991. This was the beginning of a very deep recession for the state of California, which lasted through the mid 1990's and it was only in 1996-1997 when the state started recovering. That is why it is not surprising that there was a decline in the number of CFD and AD bonds issued during the first half of that decade, and especially in the mid 1990s.

In 1990 the collapse of the Berlin Wall signaled the end of the Cold War and defense spending in California decreased significantly. This led to considerable reductions in the state's defense and aerospace industries, which resulted in numerous layoffs. In 1993 major defense cuts were announced that further reduced procurement and led to massive military base closures. Consequently, there was a major downsizing of the state's aerospace industry (Figure V). During the period 1990 through 1996, employment in the aircraft and parts, missiles and space vehicles, and search and navigation instruments sectors of the aerospace industry decreased by 48.9%, 65.8%, and 43.3%, respectively. Over the same period, the high technology industry comprised of the aerospace and electronics sectors experienced a decline of 26.2% (Figure VI). At the same time, to make matters worse, California was hit hard by a series of natural and self inflicted disasters, the Sierra Madre earthquake in Los Angeles County and the Oakland Hills fire in 1991, the earthquakes in Palm Springs, Ferndale, and Yucca Valley and the riots in South Central Los Angeles in 1992, as well as the Northridge earthquake in 1994. These factors resulted in a much longer and deeper recession than the rest of the United States (Figure VII). The rate of unemployment in California soared from 5.1% in 1989 to 9.5% in 1993 (an increase of 87.1%), while the unemployment rate in the U.S. as a whole increased by only 30.2%, from 5.3% in 1989 to 6.9% in 1993. The construction industry was severely impacted by these events. Total building permits in California in 1991 fell by 55.4% from their 1989 level. The drop in number of building permits issued was even larger in 1993, 64.4%, as compared to their 1989 level. It took a while for the state to recover from this recession but during the latter half of the 1990s, California's economy grew faster. By 1999 the unemployment rate was down to 5.3% and in 2000 it decreased further to 5.0%. The computer and electronics industry came out of recession and the construction industry, although slowly, started recovering as well. By 1999, building permits had grown by 65.5% as compared to their level in 1993. There was again a growing need of funding sources for the further development of numerous projects throughout the state. The issuance of Mello-Roos bonds was on the increase during this period. In 1999 the number of CFD bonds issued was double the one in 1992. That number grew further in the next few years and reached 119 CFD transactions in 2004.

FIGURE V: AEROSPACE EMPLOYMENT IN CA: 1988-2001

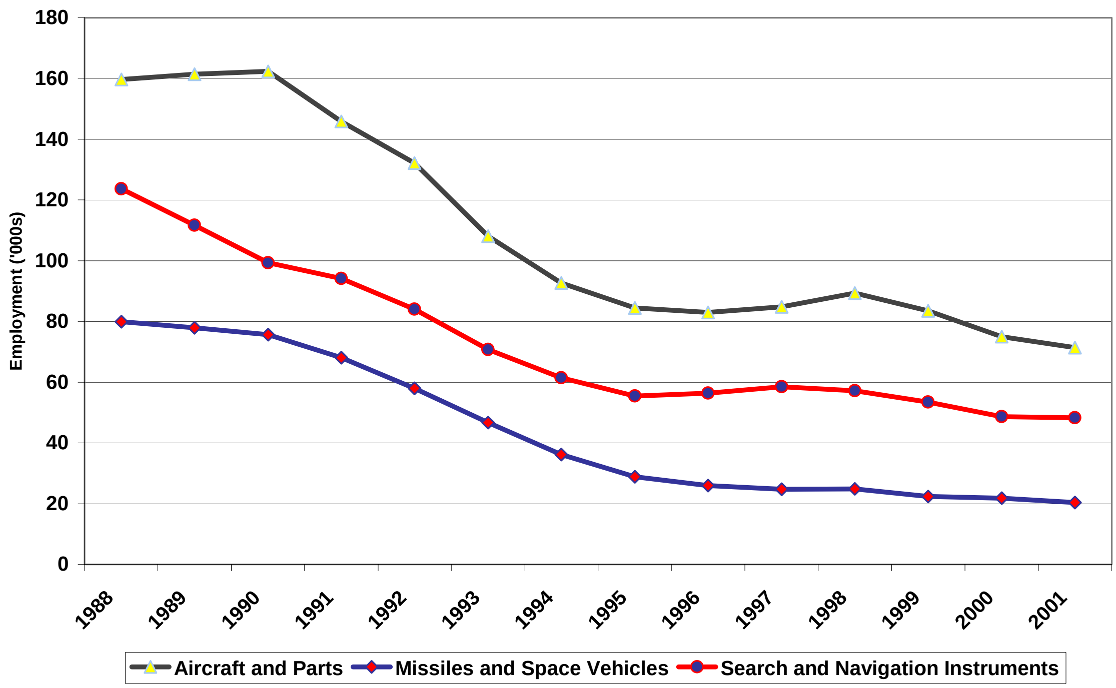


FIGURE VI: TOTAL HIGH TECHNOLOGY EMPLOYMENT IN CA: 1988-2001

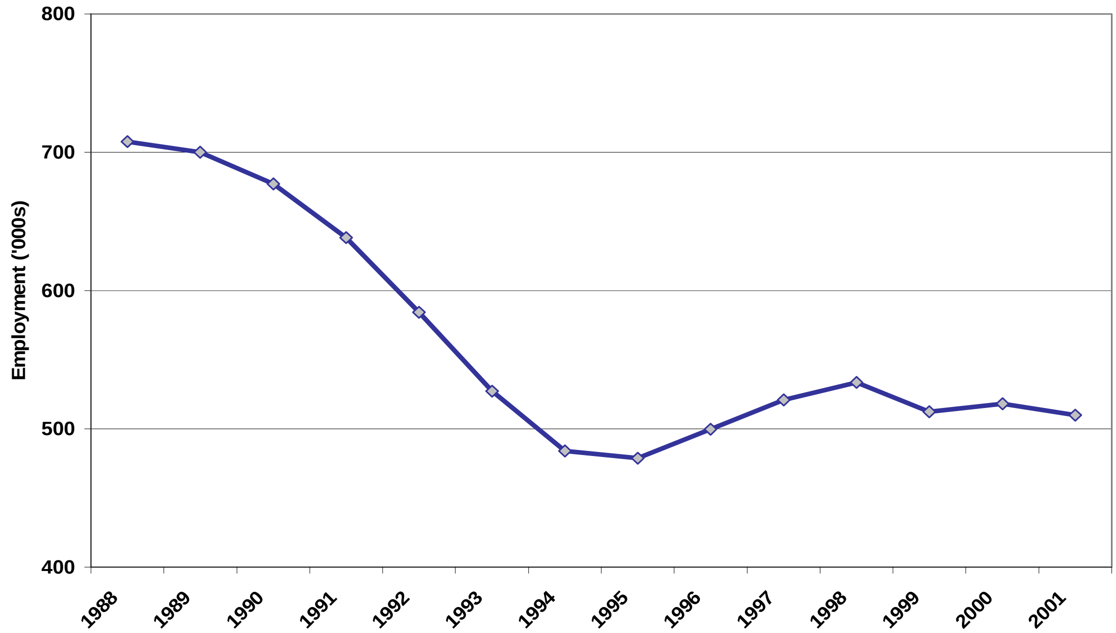
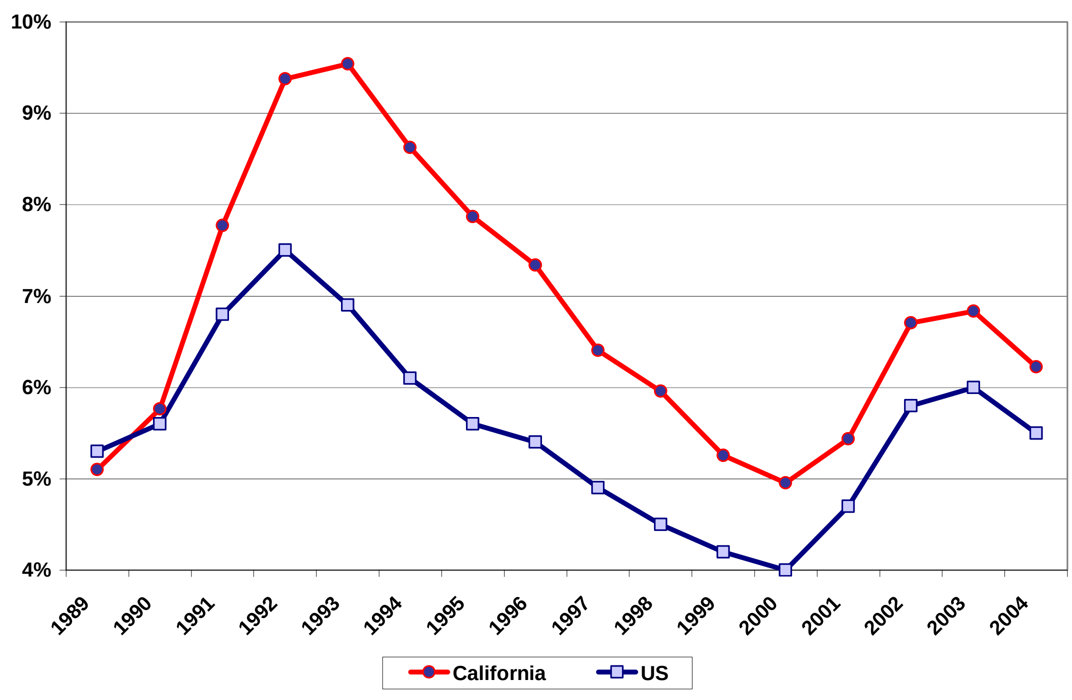


FIGURE VII: UNEMPLOYMENT RATE: 1985-2004



6 The Default Occurrence of Mello-Roos and Assessment District Bonds: 1985-2004

This section starts with a discussion of the characteristics of the major issuers of Mello-Roos bonds in California: their agency type, geographic location, etc., as provided by CDIAC's fiscal year status reports[15]. We then calculate marginal and cumulative default rates utilizing Altman's mortality rate methodology for CFD, and subsequently, for AD bonds, and compare them with other municipal bonds' default rates.

6.1 Mello-Roos Bonds

Of the CFD issues reported in CDIAC's 2002 Yearly Fiscal Status Report (including information for FY 92/93 through FY 01/02, with data for FY 92/93 being for the second half of the fiscal year only), cities were the predominant issuer among the state and local agencies, with school districts being the second major issuer. Table 1 summarizes the CFD issuers based on agency type. There are ten agency types presented in the table with their share of bond issues listed as percentage of the total CFDs that were issued during the period of the second half of FY 92/93 through FY 01/02. Our further analysis of the default rate of the CFDs issued includes data samples that cover a more extensive time period (1985 through 2004) but issuance data by type of agency was available only for the ten fiscal years described above.

[15] Data available on fiscal year basis only.

Table 1: CFD Issuers by Type of Agency

Agency Type	Percent of Total[1]
City	51%
School District	28%
County	10%
JPA	5%
Water District	3%
Redevelopment Agency	2%
Special District	1%
City/County	0%
Community Services District	0%
Utility District	0%
Total	**100%**

[1] Totals may not add due to rounding. Percent equal to zero for last three categories due to rounding.

For that same 10-year period, CFDs based in Southern California accounted for 54.2% of all bond issues included in that report. The most issues were reported by Riverside and Orange counties, 21.9% and 13.4%, respectively. The next five counties that reported the highest number of issues were San Bernardino (8.9%), San Diego (8.4%), Sacramento (7.0%), Los Angeles (7.0%), and San Joaquin (6.2%). Based on the additional data we collected from CDIAC and California Tax Data, out of all bond issues for FY 02/03, 41.8% were issued by school districts, 37.3% by cities, 8.2% by water districts, 6.4% by counties, and the remaining 6.3% by community services districts, redevelopment agencies and public financing authorities. For FY 03/04 the predominant issuer were cities (50.0%), followed by school districts (28.6%), public financing authorities (7.1%) and water districts (5.4%).

Of the total number of 1,230 CFD deals issued from 1985 through 2004, 311 were either called or matured during that time, leaving 919 CFD issues outstanding for that period. Of those 919 issues outstanding, 27 defaulted by our terminal date, December 31, 2004 (Table 3). Therefore, total defaults were 2.94% of those CFDs issued and not refunded or matured (Figure VIII) in terms of number of transactions. During the same period, the default rate in terms of par amount of the defaulted Mello-Roos bonds was 2.51% of the par amount of all CFD bonds issued (Figure IX).

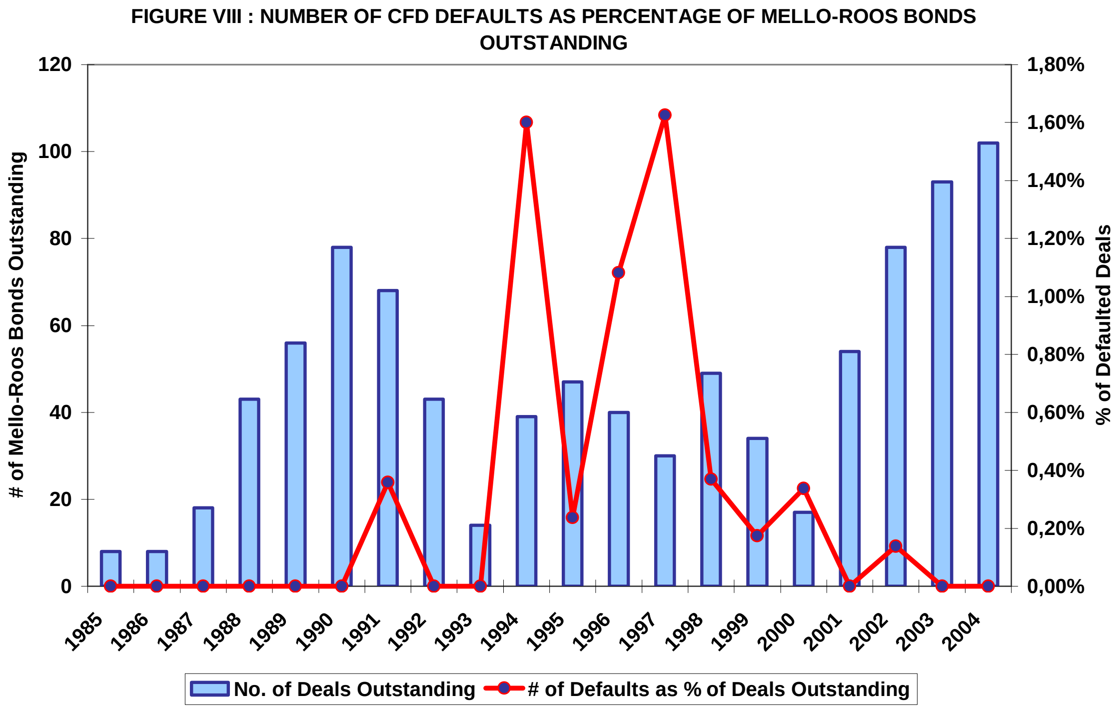
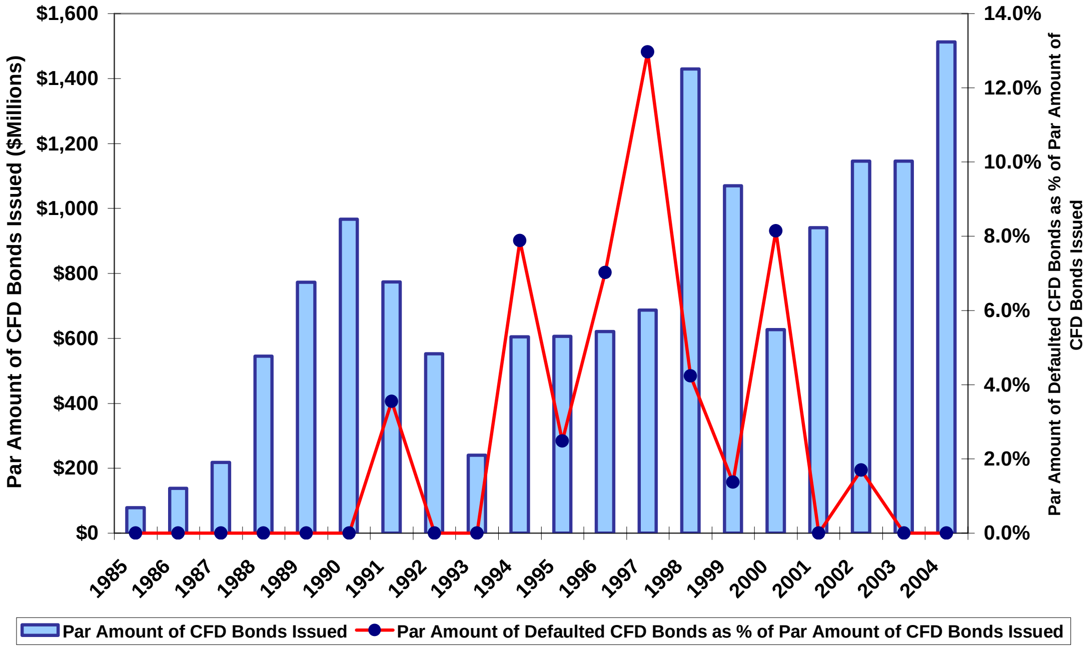


FIGURE IX: PAR AMOUNT OF CFD DEFAULTS AS % OF PAR AMOUNT OF CFD BONDS ISSUED: 1985-2004



As a next step, using Altman's mortality rate methodology, we have calculated the marginal and cumulative default rates for the entire population of CFD issues for the entire period from 1985 through 2004. The data in Table 2 show our mortality rate computations. The data include individual year and cumulative mortalities for up to twenty years after issuance[16].

Table 2 CFD Bonds Marginal and Cumulative Default Rates (%) (1985-2004)

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
MMR	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00	1.60	0.24	1.08	1.63	0.37	0.17	0.34	0.00	0.14	0.00	0.00
CMR	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.36	0.36	1.95	2.19	3.24	4.82	5.17	5.33	5.65	5.65	5.78	5.78	5.78

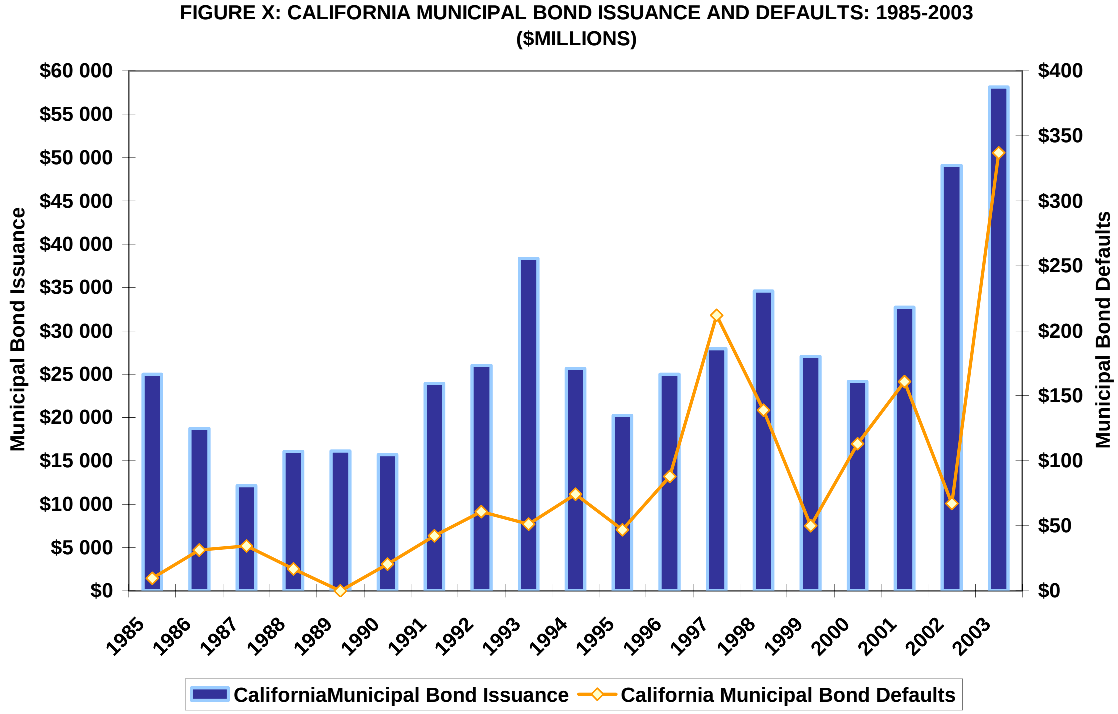
[16] Marginal mortality rates are calculated as the ratio between the number of defaults in any given year and the number of issues outstanding in that year.

As can be seen from Table 2, CFDs had a zero mortality rate for the first six years after issuance, from 1985 through 1990. In 1991 there was one defaulted CFD transaction and then the next two years the mortality rate of CFD bonds was zero once again. The next nine years after issuance were the ones in which CFD mortalities ranged from a high of 1.60% in 1994 and 1.63% in 1997 to a low of 0.14% in 2002 and no defaults reported in 2001. There were no first-time defaults in the last two years of our sample. Thus, defaults were first observed starting in 1991, with the last default reported in 2002. Please refer to Table 3 for more details on the time of default occurrence.

Table 3: CFD Default Occurrence by Year

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL
No. of Defaults	0	1	0	0	6	1	5	8	2	1	2	0	1	0	0	**27**

As previously described, we have considered default to be each event in which there was a missed payment of interest and/or principal to bond holders. For each issue, default was counted only once, at the first time of occurrence. As can be seen from Table 3, 1997 was the year with most defaults, with 1994 and 1996 being the years that were the next most predominant in terms of number of defaults. This is not surprising, since this was a clear result of the recession in California during the first half of that decade. In fact, a growing trend in defaults was observed overall in California during that period as illustrated by Figure X.

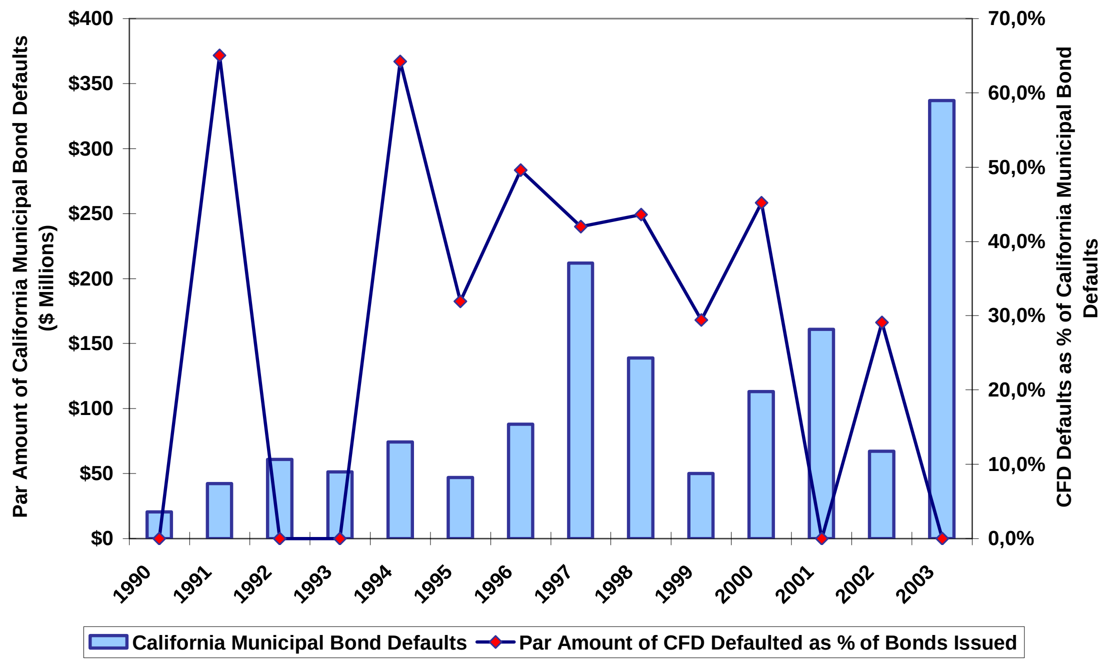


In fact, CDIAC reports show that municipal defaults reached a high of nearly $215 million in 1997. In its November 1997 issue, CDIAC argued that "this high level of defaults generally represents a lingering effect of the state's recent severe economic recession, which caused real estate values to plummet and undermined the security for bonds issued by local agencies to finance infrastructure in real estate development projects." While in 1990 none of the municipal defaults in California were comprised of CFD bond transactions, in 1994 Mello-Roos bonds accounted for 64%, in 1996 – for nearly 50%, and in 1997 for 42% of all municipal defaults in the state (Figure XI). As discussed earlier, the high level of CFD defaults during that period was due to the state's prolonged real estate recession. Since Mello-Roos and other land secured bonds have debt service reserve funds, capitalized interest accounts and other sources of liquidity as described in the earlier sections of this paper, their performance tends to lag the market as those cushions can delay a bond default for a period of time.[17] Thus, land secured bond defaults are often characterized as a lagging economic indicator of the real estate market. This explains the fact that even though California's market had stabilized by 1997, CFD defaults were most pronounced in that year and around that time in general.

As illustrated in Figure X, however, in 2001 and especially in 2003, there was another peak in California municipal bond defaults. These can be viewed as direct consequence of "the significant changes in the economic and geopolitical landscape since 1999 – a protracted recession, war, increased threat of terrorism, and fear of Severe Acute Respiratory Syndrome (SARS)", which led to "revenue reductions, budget deficits, reduced general reserves, and therefore, an erosion in municipal credit" (Litvack et al. 2003). None of those defaults, however, were comprised of Mello-Roos bonds. In 2003 and 2004 there were no CFD defaults observed in the market place. This can be explained by the fact that although the tragedy of September 11, 2001, further terrorist activities, and the mild recession which began in mid-2001 affected the economy of California causing the state to experience a decline in traffic within new home projects immediately after the September attacks, sales volumes relatively quickly returned to previous levels, primarily driven by excess demand (stimulated by the historically low interest rates) and not sufficient supply, and in 2004 appeared to be strong.

[17] Usually for about 3 years. See Altman and Kishore (1995), for example.

FIGURE XI: MELLO-ROOS BOND DEFAULTS AS % OF CALIFORNIA MUNICIPAL DEFAULTS: 1990-2003



6.2 Assessment District Bonds

As presented in the previous section, during the period 1985-2004, the municipal bond market in California experienced numerous events of default. The total par amount of all bonds issued during that period amounted to nearly $517 billion, of which the par amount of the defaulted bonds was $1.6 billion. Thus, for the California municipal bond market overall, the average rate of default was around 0.30%. Out of the $1.6 billion defaulted par amount, the par amount of defaulted CFD bonds accounted for $369 million, or 23.7%.

In this section, we analyze the default experience of Assessment District bonds over the same time period. Of the total number of 2,307 Assessment District bonds issued from

1985 through 2004, 518 were either called or matured during that time, leaving 1,789 AD deals outstanding for that period. Of those 1,789 deals outstanding, 31 defaulted by our terminal date, December 31, 2004 (Table 4). Therefore, total defaults were 1.73% of those ADs issued and not refunded or matured (Figure XII) in terms of number of transactions. During the same period, the aggregate default rate in terms of par amount of the defaulted Assessment District bonds was 1.96% of the par amount of all AD bonds issued (Figure XIII). When compared to the $1.6 billion defaulted par amount of all municipal bonds in the state, the par amount of defaulted AD bonds accounted for $244 million, or 15.3%.

As can be seen from Table 4 and from Figures XII and XIII, 1994 and 1996 were the two years with most Assessment District bonds defaults, five, followed by 1997 and 1999, with four defaults occurring in each of those years. Overall, AD bond defaults occurred mostly during the period 1992 through 2000, with 28 out of the 31 total defaults, or more than 90% of all AD bond defaults, occurring during that period. These results are not surprising given the recession during the first half of the 1990s. In addition, the fact that Assessment District bonds, like Mello-Roos bonds, are a lagging economic indicator of the real estate market explains the default occurrence during the second half of the 1990s and is consistent with CDIAC's reports of peaks in the overall default occurrence of California municipal bond defaults during that period, and, especially, in 1997. While in 1990, none of the state's municipal bond defaults were comprised of CFD bonds, 11.2% of all defaults in that year were due to AD bond defaults. Furthermore, most of the state's municipal defaults during the period 1994-1999, were comprised of CFD and AD bond defaults. As discussed earlier, CFD bonds accounted for 64%, nearly 50%, and 42% of all municipal defaults in 1994, 1996, and 1997, respectively. Meanwhile, in 1994 AD bonds accounted for over 40%, in 1995 – for nearly 74%, in 1996 – for 38%, and in 1997 – for nearly 37% of the defaults observed (Figure XIV), which, combined with the CFD defaults for the same period, accounts for almost all municipal bond defaults in the state in that period.

Table 4: AD Default Occurrence by Year

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	TOTAL
No. of Defaults	1	0	3	0	5	3	5	4	1	4	3	1	1	0	0	**31**

FIGURE XII: NUMBER OF AD DEFAULTS AS PERCENTAGE OF ASSESSMENT DISTRICT BONDS OUTSTANDING

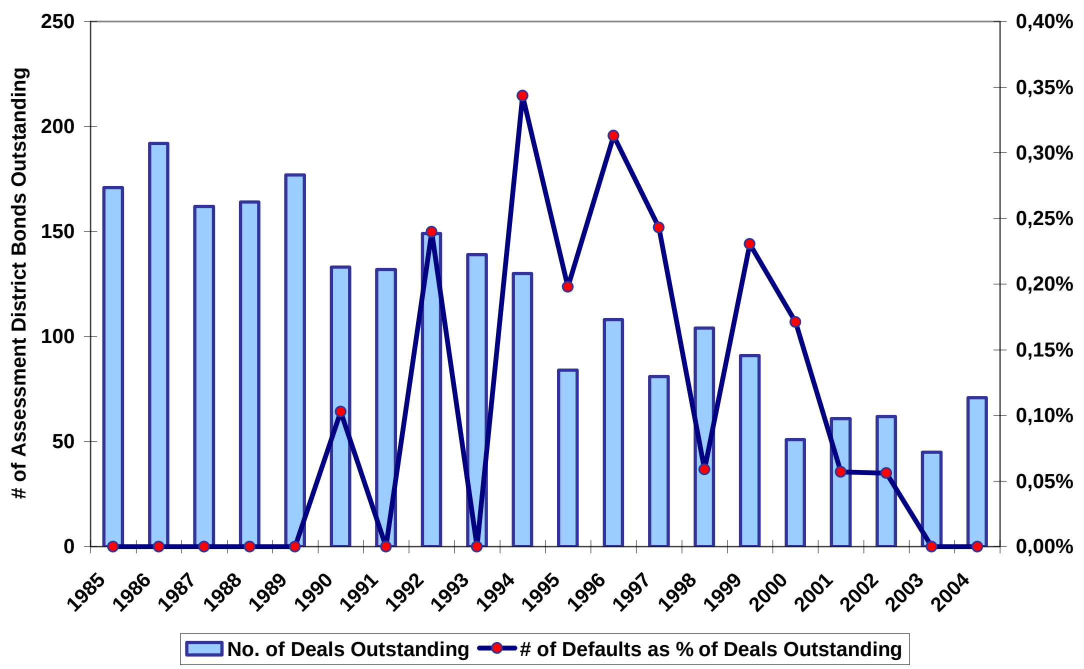


FIGURE XIII: PAR AMOUNT OF AD DEFAULTS AS % OF PAR AMOUNT OF AD BONDS ISSUED: 1985-2004

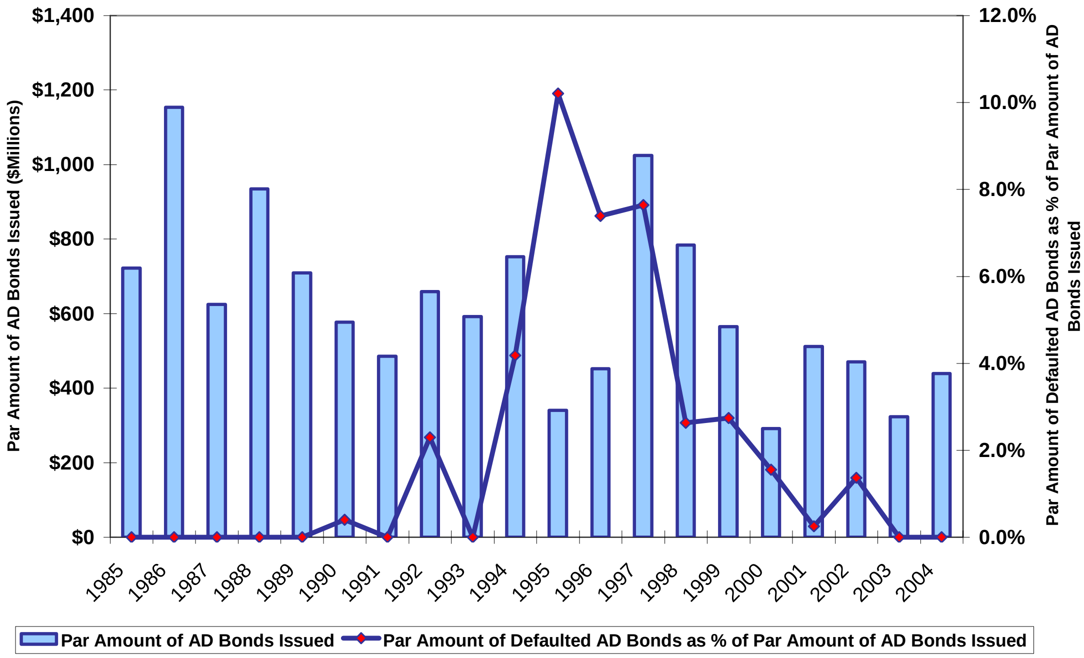
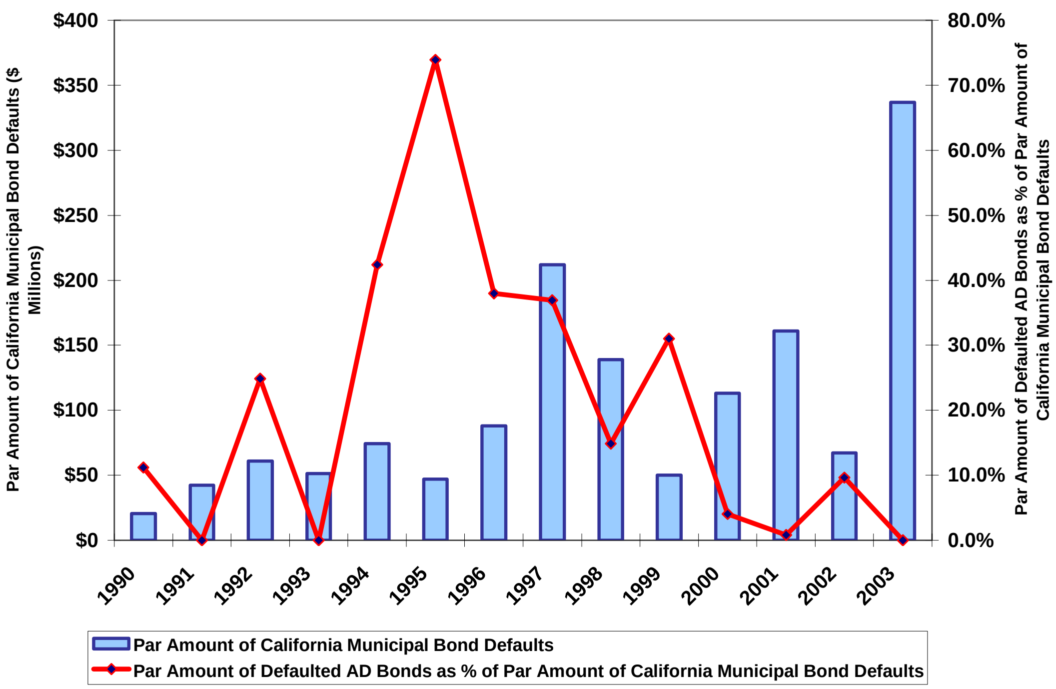


FIGURE XIV: ASSESSMENT DISTRICT BOND DEFAULTS AS % OF CALIFORNIA MUNICIPAL DEFAULTS: 1990-2003



As a next step, using Altman's mortality rate methodology, we have calculated Assessment District bonds' marginal and cumulative mortality rates (Table 5). As can be seen from the table, much like CFD bonds, ADs had a zero mortality rate for the first five years after issuance, from 1985 through 1999. While there were no CFD defaults in 1990, there was one AD default in that year, resulting in a mortality rate of 0.10%. 1994 through 2002 was the period in which AD mortality rates ranged from a high of 0.34% in 1994 and 0.31% in 1996 to a low of 0.06% in 2001 and 2002 and no defaults reported in 2003 and 2004. The cumulative default rate for the twenty-year period amounted to 2%, which is less than half the cumulative default rate of CFD bonds over the same period.

Table 5 AD Bonds Marginal and Cumulative Default Rates (%) (1985-2004)

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
MMR	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.24	0.00	0.34	0.20	0.31	0.24	0.06	0.23	0.17	0.06	0.06	0.00	0.00
CMR	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.34	0.34	0.68	0.88	1.19	1.43	1.49	1.72	1.88	1.94	2.00	2.00	2.00

As illustrated earlier in Figure II and Figure III, AD bonds were often issued in small sizes. This might be due to the fact that the special assessment levy is only based on direct benefit (individual projects) and not on master plan situations. Hence, it might be appropriate to restrict our sample and include only issues larger than $1,500,000 and see how the default rate changes as a result of that restriction.

If we consider only AD bonds with par size equal to or greater than $1,500,000, then our sample decreases to 1,302 bond issues, out of which 311 bonds either matured or were called during the 1985-2004 period. Thus, the total number of outstanding AD bonds for that period is 991, out of which 25 deals defaulted by our terminal date, December 31, 2004. Therefore, the aggregate default rate for our restricted sample of ADs (considering only the ones issued and not refunded or matured) is 2.52%, which is 0.81% higher than the 1.73% we had before for the unrestricted sample. The AD bonds' cumulative default rate over the entire 20-year period is now 2.84% (Table 6), which represents an almost 30% increase in the cumulative mortality rate of the unrestricted AD bonds' sample.

Table 6 AD Bonds Marginal and Cumulative Default Rates (%) (1985-2004)

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
MMR	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.30	0.00	0.62	0.35	0.44	0.42	0.10	0.28	0.09	0.00	0.08	0.00	0.00
CMR	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.50	0.50	1.11	1.46	1.89	2.30	2.40	2.68	2.76	2.76	2.84	2.84	2.84

If we were to analyze the performance of the non-rated land secured market as a whole (as comprised of CFD and AD Bonds), we would see that for the 1985 through 2004 period, there were a total of 3,537 bond issuances, of which 829 were either called or refunded prior to December 31, 2004, leaving 2,708 deals outstanding for the period under investigation. Out of those 2,708 outstanding deals, 58 defaulted before the termination date of our study, resulting in an aggregate default rate of 2.14%. Estimated marginal mortality rates vary from a high of 0.60% in 1994, to 0.56% in 1997 and 0.49% in 1996, respectively, to a low of 0.04% in 2001 and ultimately, 0.00% in 2003 and 2004 (Table 7).

Table 7 Non-Rated Land Secured Market Marginal and Cumulative Default Rates (%) (1985-2004)

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17	Y18	Y19	Y20
MMR	0.00	0.00	0.00	0.00	0.00	0.08	0.07	0.19	0.00	0.60	0.21	0.49	0.56	0.13	0.22	0.21	0.04	0.08	0.00	0.00
CMR	0.00	0.00	0.00	0.00	0.00	0.08	0.16	0.35	0.35	0.95	1.15	1.63	2.18	2.31	2.52	2.73	2.77	2.85	2.85	2.85

As can be seen from Table 7, the mortality rate of the non-rated land secured market in California as comprised of the CFD and the AD bonds issued is not that high. The cumulative default rate for that market over the entire 20-year period is 2.85%. To be able to assess this rate, as well as the CFD and AD default rates, however, we need a benchmark against which to compare and be able to evaluate the default experience of these bonds. In the next section we examine the performance of the U.S. municipal market and compare it to the performance of the California non-rated land secured market.

7 The Default Experience of the U.S. Municipal Market

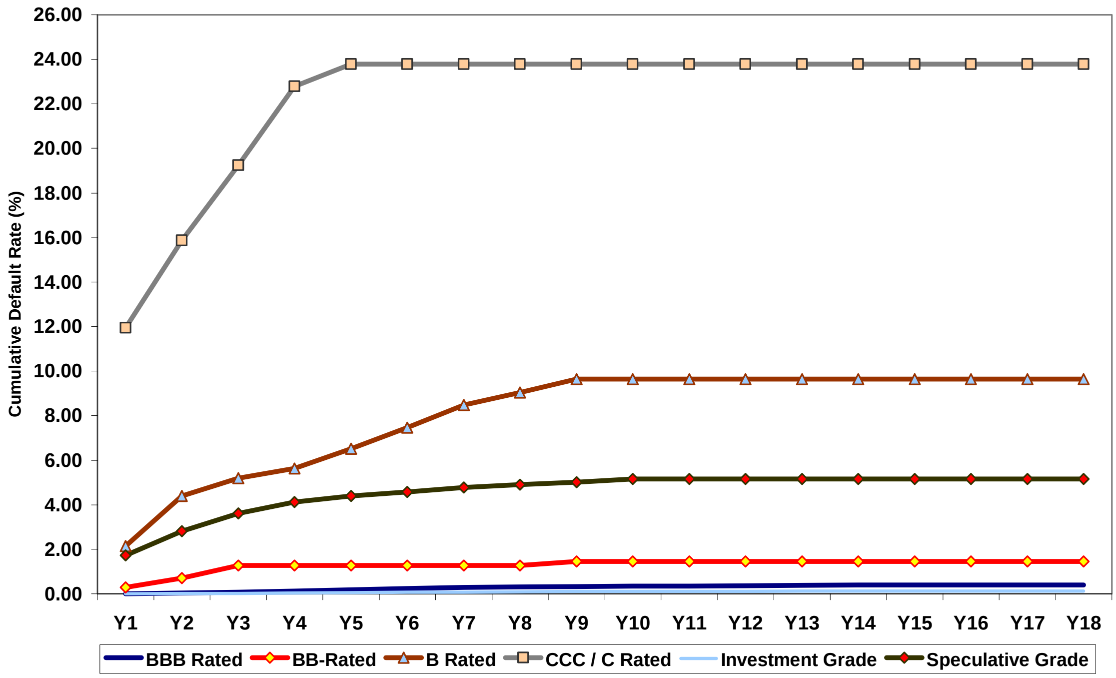
There have been numerous studies on the default experience of the U.S. rated municipal market[18] but they either cover a different time period, or use a different methodology in calculating the default rate of the analyzed securities. The only study that seems somewhat comparable to ours is Standard & Poor's (S&P's) "U.S. Municipal Rating Transitions and Defaults, 1986-2003", published in April 2004. This study covers a similar time span and examines credit types such as general obligation (GO), lease/appropriation/moral obligation, special tax (sales, gas, etc.), special district, water and sewer revenue, public power, airports, ports, toll roads and bridges, parking, various types of bond pools, transit, public and private higher education, auxiliary higher education debt, independent schools, hospitals (stand alone and systems), continuing care, and physicians' practices.

[18] See for instance "Municipal Default Risk" (Fitch IBCA, 1999); "Municipal Default Risk Revisited" (Fitch Ratings, 2003); "Moody's US Municipal Bond Rating Scale" (Moody's Investors Service, 2002); etc.

S&P conducts its default study on the basis of the static pool methodology, where a static pool is formed on the first day of each year examined in the study and followed from that point on. All ratings included in the study are grouped into these pools and are followed year-to-year within each pool. S&P describes that "for example, the 1986 static pool comprises all parity debt outstanding as of January 1, 1986. The 1987 static pool was formed by adding new parity ratings first rated in 1986 to the still outstanding ratings of the 1986 static pool and subtracting those ratings that defaulted or were set to non-rated." The study then presents the annual default rates calculated for each static pool and the estimated cumulative default rates that average the experience of all static pools. In obtaining the cumulative default rate estimates, the authors first calculate "marginal default rates, conditional on survival (survivors being non-defaulters) for each possible time horizon and for each static pool; weight averaging the conditional marginal default rates, and accumulating the average conditional marginal default rates." Cumulative default rates are then equal to one minus the product of the proportion of survivors (non-defaulters).

To avoid the risks of magnitude skewing results, S&P's study is based on individual issuances, rather than on dollar amounts. The study's cumulative default analysis tracks the historical average of default of a rated obligation at any point in time during its life. The obtained results indicate that the number of defaults and cumulative default rates for S&P public debt are extremely low, with no defaults reported in the 'AAA' or 'AA' rated categories for the period 1986-2003. The cumulative default analysis further indicates that the chance of default on both an 'A' and 'BBB' rated debt is less than 1% over an 18-year horizon and that "it is only at the speculative-grade level that the cumulative default rate becomes significant." At the 'BB' level, 1% of the average pool has defaulted by the third year; at the 'B' level, 2.1% of the typical pool defaulted within the first year (refer to Table 8). Figure XV illustrates the default experience of 'BBB', 'BB', 'B', 'CCC/C' rated debt, as well as of investment-grade and speculative-grade level debt.

Figure XV: CUMULATIVE DEFAULT RATES (%) OF STANDARD & POOR'S PUBLIC DEBT (1985-2003)



Although the study provides a good analysis of the overall rated market, it admits that "limited light can be derived" from it "with respect to the credit performance of speculative-grade public finance debt due to the sparse rating coverage of the below-investment-grade sector." S&P argues that it believes the default experience in the unrated market to be meaningfully higher than reflected in the investment-grade-rated market but does not undertake to determine how much higher its default is.

Table 8 Cumulative Default Rates (%) (1985-2003)																		
Rating	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**	**Y7**	**Y8**	**Y9**	**Y10**	**Y11**	**Y12**	**Y13**	**Y14**	**Y15**	**Y16**	**Y17**	**Y18**
AAA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.07
BBB	0.00	0.04	0.08	0.13	0.18	0.24	0.29	0.31	0.33	0.34	0.35	0.36	0.38	0.40	0.40	0.40	0.40	0.40
BB	0.29	0.70	1.27	1.27	1.27	1.27	1.27	1.27	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46
B	2.14	4.40	5.20	5.63	6.52	7.47	8.48	9.04	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65	9.65
CCC/C	11.94	15.87	19.24	22.79	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78	23.78
Inv. Grade	0.00	0.01	0.02	0.04	0.05	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.13	0.13	0.13	0.13
Spec. Grade	1.72	2.82	3.61	4.12	4.39	4.58	4.78	4.90	5.02	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15
All Rated	0.02	0.04	0.07	0.09	0.11	0.12	0.14	0.15	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.19	0.19	0.19

Keeping in mind the different methodologies for analyzing the default performance of the bonds in our and S&P's study, there is no direct and straightforward comparison between the cumulative default rates in Table 8 and the cumulative default rates we calculated for the CFD bonds. However, as can be seen from Table 8, the one year cumulative default rate of AA rated bonds is zero percent, which compares to the default rate for the Mello-Roos bonds in the first few years of our sample. In the next few years their cumulative default rates were in the range of the default rates of the BBB and BB rated bonds[19]. The performance of the restricted sample of AD bonds was similar to that of AA rated bonds for the first five years, while for the next two years it was between that of BBB rated and BB rated bonds. In the next two years the default rates of the restricted sample of AD bonds were between the default rates for BB rated and B rated bonds, while in the last few years they were closer to those for B rated bonds. Comparable was the performance of the unrestricted sample of AD bonds. Their cumulative default rates initially were lower than those for BBB rated bonds, while in the later years of our sample they started

[19] This implies that the non-rated Mello-Roos bonds are, in the long run, riskier than BBB-rated municipal bonds. Thus, one would expect that the yields on the non-rated Mello-Roos bonds are higher than the ones for BBB-rated municipal bonds. In order to determine if that is the case, we have compared the 30-year yield on a sample of non-rated CFD bonds issued during the period 1998-2004 to the 30-year yield on BBB-rated municipal bonds. Appendix C illustrates that relationship. As expected, due to the higher risk they bear, non-rated CFD bonds carry yields that exceed the yields on BBB-rated municipal bonds.

approaching the default rates for BB rated bonds and then began to behave closer to B rated bonds but still remaining lower than the default rates for those bonds.

If we were to summarize and compare the performance of the entire non-rated land secured market in California over the 1985-2003 period (as comprised of the CFD and AD bonds), we see that for the first five years, it behaves like AA rated bonds, then that market's default experience becomes comparable to the default experience of BB rated bonds, and in the last few years under investigation, its default rates seem to be more like those for bonds between the BB and B rated categories and below the B rated category. Hence, if we were to assess the credit quality of the California non-rated land secured market on average, it seems to be comparable to bonds of rating class between the BB and B categories.

8 Recovery

As discussed in the earlier sections, the default of a CFD or an AD bond issue is defined as the first missed payment of interest or principal due on the bonds. This occurs as a result of a delinquency in the payment of the special taxes or special assessments levied on the property securing the bonds. In such instances, pursuant to Section 53356.1 of the Mello-Roos Act, the district may pursue judicial foreclosure action to foreclose the lien. In such an action, the real property subject to the unpaid special tax (or assessment) may be sold at a judicial foreclosure sale in an attempt to obtain funds to pay the special taxes that support the payment of the debt service on the bonds. However, if the amount of special tax (special assessment) delinquency on a particular parcel is so small that the cost of foreclosure proceedings will far exceed the amount of such delinquency, the district may delay foreclosure proceedings until there are sufficient special tax (assessment) delinquencies accruing to such parcel (including interest and penalties thereon) to warrant the cost of foreclosure proceedings. A covenant for foreclosure is included in the offering documents of every CFD or AD bond issue. It allows for the trading of the bonds in the secondary market even though interest and principal are not being paid at the time of default. A foreclosure sale in such case is an attempt to stimulate transfer of ownership in the underlying collateral to a new party that will assume the responsibility of paying the special taxes (assessments) and thus the bonds will be brought current.

When a bond issue defaults, the bonds still remain outstanding and accrue interest. However, there is no acceleration of the lien in the event of default. An investor who owns bonds of a defaulted issue in most instances can still sell them. However, the realized non-payment on the bonds will negatively affect their price[20] and that investor will only be able to receive at best twenty or thirty cents on the dollar. If a successful foreclosure sale occurs to a third party, however, the special taxes (assessments) are brought current, the default is cured and the price of the bonds goes up.

Foreclosure sales are not always successful and it might take a long time for a defaulted bond issue to be cured. In this section of the essay we attempt to determine what the

[20] Issuers of CFD and AD bonds have continuing disclosure obligations and the obligation to report material events, such as defaults, in order to effectuate a transparent market where buyers and sellers know what they are buying.

recovery of the defaulted CFD and AD bonds in our sample has been, even though recovery data is not systematic, which makes this analysis difficult.

It was a challenge to determine the recovery values of the sample of defaulted CFD and AD bonds, keeping in mind the scarcity of information, the long history of some of the defaults and the limited secondary market trading that occurs. In order to obtain recovery data, we utilized a number of sources such as discussions with investment bankers and municipal bond attorneys specializing in workouts and settlements, as well as the Municipal Bond Advisor's publications. For some of the issues in our sample we were able to confirm that a full recovery occurred, while for others the likelihood of this happening was very strong. Other issues made only partial payment to bond holders and even though those traded relatively rarely, we assumed that the prices at which they could be found were a good estimate of the price floor for those issues. This was a reasonable assumption given the much higher potential for recovery in case of a workout or settlement with new potential developers. In a few rare cases we found that bonds were either valued at zero or at a discount because they were very deep in default or investors preferred to sell them below par just to get some of their initial investment back. Overall, our analysis of the 58 defaulted Mello-Roos and Assessment District bonds resulted in a recovery rate of 58%, calculated on a dollar-weighted average basis. This compares favorably with the recovery rates of rated municipal and corporate bonds. In its "US Municipal Bond Rating Scale" (2002) study, Moody's reports that "the average municipal bond recovery is 66% of par as compared to 42% of par for corporate bonds. Fitch confirms these results in its "Municipal Default Risk Revisited" (2003) report, showing that "defaulted municipal bonds have relatively high recovery rates (about

67%)" when valued based on dollar-weighted average. This study further shows that the dollar-weighted recovery rate of general purpose bonds (including certificates of participation and assessment districts' defaults) is 90.27%, with recovery rates on general obligation bonds being at 100%. In most cases, CFD and AD bonds' defaults ultimately get cured and those bonds' recovery rates then will be closer to those of general purpose bonds.

9 Conclusion

The results we have obtained in this paper indicate that Mello-Roos and Assessment District bonds sold in the municipal bond market bear risk that is not as high as previously expected. Their default rates over the 1985-2004 period average 2.94% and 1.73% in terms of number of issues for CFD and AD bonds, respectively (2.52% for the restricted sample of AD bonds), and 2.14% for the California non-rated land secured market as a whole (as comprised of AD and CFD bonds), with a dollar-weighted average recovery rate of 58%. The twentieth-year cumulative mortality rates are 5.78%, 2.0% (2.84%), and 2.85% for the CFD bonds, AD bonds (restricted sample of AD bonds) and the entire California non-rated land secured market, respectively. These default rates are above the overall default rate for the U.S. municipal bond market, which is primarily comprised of investment grade issues, but are comparable to BB and B rated municipal bonds by Standard & Poor's. The implications are that the credit quality of Mello-Roos bonds is much better than what the perception was in the industry for a long time. This means that another look should be taken at the way such bonds are valued and the means of determining their actual credit risk to reflect that such bonds bear moderate likelihood of default. Furthermore, an additional consideration should be given to the improved mechanism for issuance of CFD bonds and the annual reporting of their fiscal status. Moreover, the recent trend of demanding additional forms of security for the bonds is another factor that makes default a less likely occurrence. The data in our study show that there are no new defaults of CFD and AD bonds in the past few years. As the economy recovers, as reflected by an increase in employment, a growing number of building permits issued, the improvement of other macroeconomic indices, and the increasing land values, we expect that this trend of low or zero default to continue, resulting in a further stabilization of the credit quality of the California non-rated land secured market (as comprised by Mello-Roos and Assessment District bonds).

APPENDIX A

Usual Sequence of Events for Mello Roos Community Facilities Districts

(Commencing with Section 53311 of the Government Code)

B E G I N   H E R E

PETITION INITIATED CFD

1. 10% Landowners
2. 10% Registered voters
3. Payment of pre-formation costs

Within 90 days

LOCAL AGENCY INITIATED CFD

1. Written request of 2 members of legislative body, or
2. Majority approval of legislative body

LEGISLATIVE BODY COMMENCES PROCEEDINGS

1. Adopt Goals and Policies
2. Adopt resolutions to:
   a. Approve boundaries
   b. Designate name of CFD
   c. Identify types of facilities & services
   d. Declare Intention to:
      1) Form CFD
      2) Levy special tax
      3) Issue bonds
   e. Set time and place of public hearing
   f. Establish voting procedures

Prepare Report

Public hearing held not less than 30 days or not more than 60 days from adoption of Resolution of Intention

REQUIRED -- Publish notice (not later than 7 days before Public Hearing)
OPTION -- Mailed notice (not later than 15 days before Public Hearing)

PUBLIC HEARING

May be continued up to 30 days, or with finding up to 6 months.

If no majority protest, resolutions adopted to form CFD* by:
1. Establishing boundaries
2. Determining necessity to incur bonded indebtedness
3. Authorizing levy of special tax
4. Approving types of facilities and services
5. Setting election

If more than 50% of registered voters (at least 6), or if the owners of more than 50% of the land area protest, then CFD abandoned for one year. If majority protest only against specific facilities, services or special tax, only that facility, service or tax must be dropped.

* Environmental review should be completed before formation of CFD

GENERAL ELECTION or SPECIAL ELECTION
90/180 days from Resolution of Formation
(unless time period shortened by 100% of electors)

2/3 vote required
(if less than 12 registered voters or if no tax on residential property -- landowner election)

ELECTION

Voters consider:
1. Levy of Special Tax
2. Establish appropriations limit
3. Authorize issuance of bonds

ACTIONS BY LEGISLATIVE BODY

1. Certify election results
2. Enact ordinance to levy special tax
3. Authorize issuance of bonds
4. Approve Preliminary Official Statement and Continuing Disclosure Agreement

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1. Record Notice of Special Tax Lien
2. Initiate validation proceedings, if necessary
3. 30 day statute of limitations

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1. Sell and deliver bonds and receive bond proceeds
2. Initiate construction or acquisition
3. Commence activities to administer debt, levy and collect special taxes and comply with continuing disclosure requirements

APPENDIX B

Overview of Community Facilities Districts ("CFDs") vs. Assessment Districts ("ADs")

ISSUE	COMMUNITY FACILITIES DISTRICT	1913-1915 ACT ASSESSMENT DISTRICT
1. **Eligible Assets**	All public improvements with a useful life of five years or more.	Public improvements which provide local special benefit to parcels within an AD.
2. **Eligible Services**	Authorized for certain types of public services, including police, fire, library, recreational, flood control and maintenance of parks, parkways and open space (certain services require registered voter approval).	Authorized only to fund operations and maintenance of facilities directly financed by an AD.
3. **Apportionment of Assessments/ Special Taxes**	Special tax is not a special "assessment" and there is no requirement that the tax be apportioned on the basis of benefit to any property. However, a special tax levied pursuant to the Mello-Roos Act may be based on a benefit received by parcels of real property, the cost of making facilities or authorized services available to each parcel, or some other "reasonable" basis as determined by the legislative body.	No assessment may be imposed on any parcel that exceeds the reasonable cost of the proportional special benefit conferred on that parcel. Only special benefits are assessable, and an agency must separate the general benefits from the special benefits conferred on a parcel.
4. **Financing District Boundaries**	May be expanded through future annexations to include other properties that might benefit from CFD facilities or services.	AD boundaries are generally fixed once assessments are confirmed.
5. **Formation Process**	Notice, public hearing, majority protest process and 2/3 vote required. Landowner election if less than 12 registered voters or if a tax is not imposed on residential property.	Notice, public hearing, majority protest process. Majority protest exists if ballots submitted in opposition to the assessment exceed ballots submitted in favor. Ballots weighed according to proportional financial obligation of the affected property.
6. **Maximum Residential Property Tax as Percentage of Sales Price**	No statutory limit, but generally limited by public agency policy to a percentage of projected (not actual) property values.	No statutory limit, based solely on special benefit.
7. **Homeowner Property Tax Bills**	Special taxes can be levied each year up to maximum rates, regardless of outstanding debt service and maintenance cost requirements. The maximum special taxes for parcels used for private residential uses cannot be increase by more than 2% per year. In addition parcels used for private residential uses cannot be increased by more than 10% to cover delinquencies caused by others.	Assessments can only be levied for existing debt service, maintenance costs, and pre-approved administrative charges.

Source: Fieldman, Rolapp & Associates

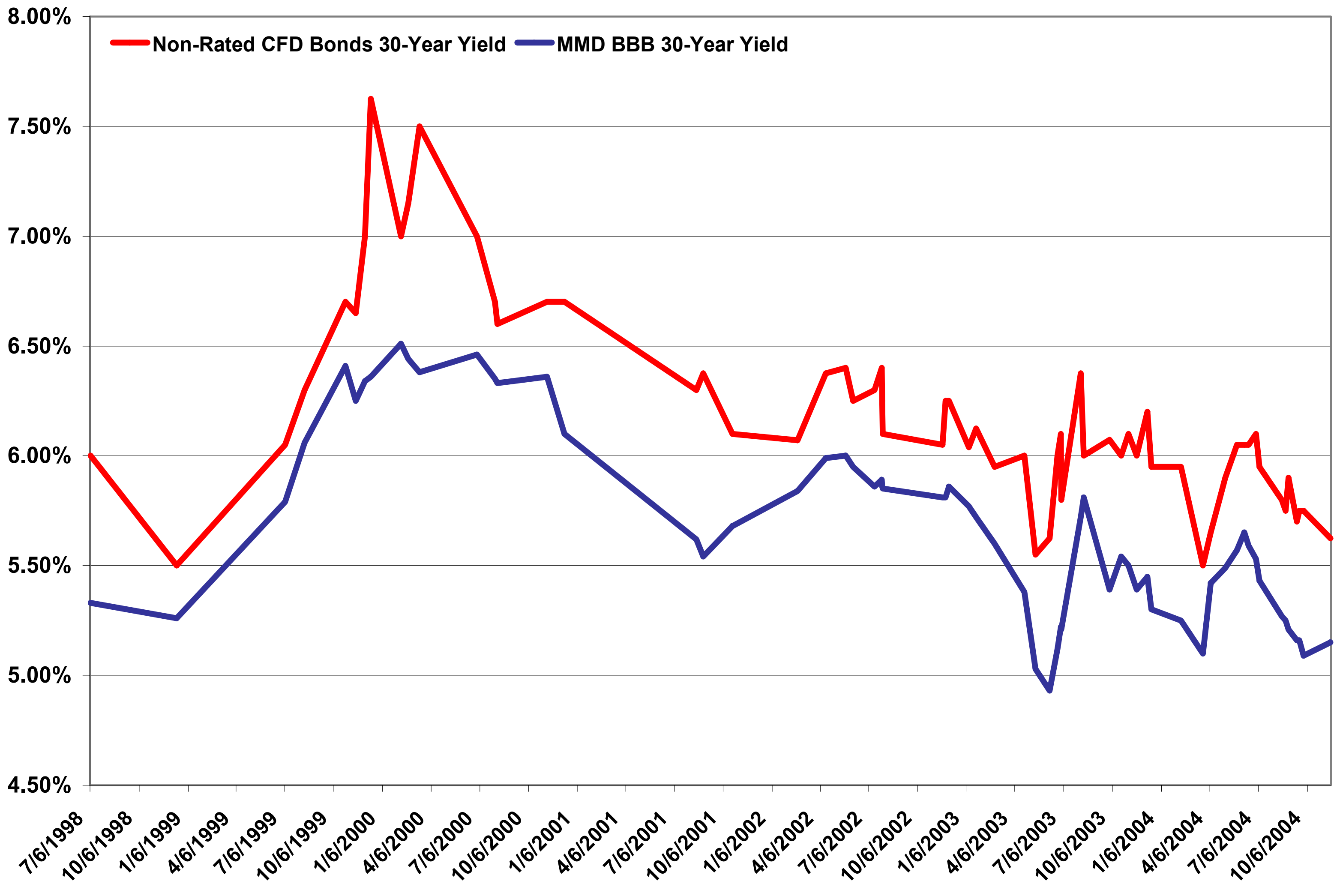
APPENDIX B (CONTINUED)

ISSUE	COMMUNITY FACILITIES DISTRICT	1913-1915 ACT ASSESSMENT DISTRICT
8. Public Property	No special tax required, so generally not taxed.	Must be assessed based on special benefit, so it generally results in an upfront cash payment/contribution to offset any assessment levy.
9. Land Use Changes	Special taxes are automatically apportioned based on a tax formula (referred to as a "Rate and Method of Apportionment"), which generally adapts to changes in land use that occur after formation of the CFD.	Assessment lien apportionments cannot easily be modified after formation of an AD, except for subdivision of existing parcels generally based on lot sizes or numbers of units in each subdivided lot.
10. Cross Collateralization & Debt Service Coverage	Parcels are generally cross collateralized, overall CFD provides 110% (or greater) debt service coverage. Therefore, delinquencies on certain parcels may require that special taxes be raised on other properties (up to maximums provided).	No cross collateralization of parcels, each parcel in AD limited to its proportional share of 100% debt service coverage.
11. Pay-as-you-go financing of infrastructure	Yes.	No.
12. Pay-off or Prepayment of Lien	Allowed if included in the Rate and Method of Apportionment, but require complicated formula to administer – usually not financially efficient.	Automatically allowed by State statute, simpler to administer than in CFD.
13. Public Agency Financing Guidelines	Must be adopted by agency prior to initiation of proceedings to establish a CFD.	None required by law. Often imposed as policy matter.
14. Acceptance by Public	Widespread use since 1996 (particularly by school districts and since Prop 218) and a strong economy have made CFDs more acceptable to homebuyers. CFDs historically had a poor reputation with many political bodies and homebuyers.	ADs are more politically acceptable in many communities.
15. Assessment/ Taxation of Undeveloped Property	Special Taxes on undeveloped land can differ from Special Taxes on developed properties.	Assessments on undeveloped land are often based on their potential development, and are generally equivalent to assessments on similar properties in their "post development" state.
16. Debt Service Structure	Usually either level debt service or increasing debt service of 2% per year.	Usually level debt service.

Source: Fieldman, Rolapp & Associates

APPENDIX C

Comparison of 30-Year Yield on Non-Rated Mello-Roos Bonds vs. BBB-Rated Municipal Bonds



APPENDIX D

List of Abbreviations

CFD – Community Facilities District

IPOs – Initial Public Offerings

S&P – Standard & Poor's

AD – Assessment District

RMA – Rate and Method of Apportionment

DSRF – Debt Service Reserve Fund

LOC – Letter of Credit

ROI – Resolution of Issuance

MMR – Marginal Mortality Rate

CMR – Cumulative Mortality Rate

SR – Survival Rate

PFA – Public Financing Authority

CDIAC – California Debt and Investment Advisory Commission

CUSIP – Committee on Uniform Securities Identification Procedures

NASDAQ – National Association of Securities Dealers Automated Quotation System

FY – Fiscal Year

JPA – Joint Powers Authority

SARS – Severe Acute Respiratory Syndrome

GO Bonds – General Obligation Bonds

Curing Default: A Theoretical Model

Abstract

This paper translates a real life example of a defaulted community facilities district (CFD) into a simple model of the strategic behavior and interaction among the participants in the district and explores in game-theoretic terms the situation of *curing* partial default, which might often create a potentially conflict situation for the participants in such CFD. The results we arrive at are quite intuitive**.** There are three types of Subgame Perfect Nash Equilibria, each of which is the result of a cost-benefit analysis performed by the players. Ultimately, in all equilibria the decision is made based on each player's expected gains as compared to the expected decision of the court and the expenditures the player will incur in going to court.

Keywords: partial default, community facilities district, CFD, equilibria
JEL: C70, D53, H74

1 Background

Since 1985, more than $13.6 billion in Mello-Roos special tax bonds have been issued by local governments in California. The asset securing these bonds is land, or more precisely, they are secured by "liens on specified parcels of real property within a defined area" (the community facilities district, or the CFD), and are "neither general obligations of municipal issuers nor personal debts of property owners[1]".

Most of these bonds are issued to finance the construction or acquisition of infrastructure in real estate development projects. Examples of the construction of public improvements funded through these bonds include roads, schools, freeway interchanges, sewage treatment plants, etc. Since the ultimate security for bondholders at the time of initial issuance of these municipal securities is the value of the raw, undeveloped land in the CFD, such bonds are often referred to as "dirt bonds".

Even though the issuance of Mello-Roos bonds enhances development by allowing public facilities in developing areas to be installed quickly, it poses the risk that because these bonds are backed by tax revenues paid from the income of the taxpayers within each CFD, at some point, if the debt burden reaches excessive levels, taxpayers may become unable or unwilling to pay. That might be the case also if the project construction and sales do not proceed according to plan, under which circumstances the landowner

[1] CDIAC Disclosure Guidelines for Land-based Securities, September 12, 1996.

may be unable to meet scheduled debt service payments. In such instances, the Mello-Roos Act pursuant to which such bonds are issued provides for judicial foreclosure at the option of the governmental issuer to remedy delinquencies of special tax payments.

Real estate development is typically comprised of two stages: land development and building construction. During the land development stage, the site is acquired and graded, infrastructure is installed, and all other activities pertaining to the conversion of raw land into improved building lots are conducted. During the second state, residential, commercial and industrial structures are constructed for sale to end users. Often times these two phases are not carried out by the same real estate developers. It is very common for a group of developers to improve raw land and then sell it to merchant builders who, under the best case scenario, contract with clients to construct residential units, or simply build such units on their own, taking the risk that there will be buyers for their product upon completion.

Most Mello-Roos bonds are issued during the first stage of raw land when there is high concentration of property in the hands of only one or few developers. This is the stage with highest credit risk, since then those property owners are responsible for all or the majority of the special taxes levied on the property in order to pay the debt service on the bonds. Under such circumstances, if these majority property owners are delinquent in their special tax payments, the reserve fund on the bonds can be depleted[2] and a bond default may occur[3]. A developer may be delinquent on its special tax payments for a

[2] Draws on the reserve fund to cover any delinquencies are often referred to as technical default.
[3] Default is defined as missed payment of principal of or interest on the bonds.

number of reasons, the most likely ones being that contrary to expectations, demand for its completed product does not materialize, or that the project ultimately does not generate the expected revenues, or costs more than anticipated[4].

In some cases, actual default can be avoided if property values in the CFD are adequate[5]. In such cases, delinquencies do not lead to investment losses to bondholders because foreclosure sales should be able to generate sufficient proceeds to pay delinquent principal and interest plus penalties. However, during the early stages of development, land values are highly volatile, which can undermine the accuracy of appraisals prepared for undeveloped property. In such cases, especially if the real estate market is experiencing a slump, foreclosure sales might fail to generate minimum acceptable bids, resulting in investment losses to bondholders. Even if land values were adequate, the judicial foreclosure process often takes a long time, which might possibly result in a non-payment of debt service. Furthermore, if a developer files for bankruptcy, the action can take much longer.

Any Resolution authorizing the issuance of Mello-Roos bonds typically includes a covenant that requires the issuing agency to initiate judicial foreclosure proceedings under specified circumstances and within a specified time period (which vary among issuers) after special tax payments have become delinquent. To order, commence and

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[4] Learning from past experience and acknowledging the intricacies of curing partial defaults, a new trend has emerged in recent years in an attempt to reduce the risk of default. That trend is to issue bonds for a particular CFD when the property is owned by merchant builders who are in the building construction stage of the project as opposed to developers who are still in the land development stage.

[5] Or if the value-to-lien ratio as measured by the value of the land and improvements in the district relative to the amount of tax-supported debt secured by liens on property in the district is significantly high. State law has established a minimum 3:1 value-to-lien requirement for Mello-Roos special tax bond issues.

diligently prosecute to judgment an action in the superior court to foreclose the lien of any special tax or installment of special tax, the agency must file a lawsuit in the Superior Court to request a judgment to foreclose on the delinquent lien. Upon receiving a judgment, the property may be sold at a foreclosure sale. The minimum bid at that sale must be equal to the amount of the delinquency, plus penalties, interest, court costs and attorneys' fees. The foreclosure action may collect only these amounts; there is no acceleration of the lien. Amounts recovered in the action in excess of what is needed to replenish the reserve fund are used to extinguish any other liens on the property.

The exact timing and amounts vary depending on the provisions of the Indenture (or Fiscal Agent Agreement) of a particular CFD but, for instance, a district may covenant for the benefits of the owners of the bonds that it will commence foreclosure proceedings within 150 days of each August 15 against parcels as to which there is an aggregate special tax delinquency of more than $10,000 and will commence foreclosure proceedings against all parcels with delinquent special tax installments within 150 days of August 15 of each bond year in which the district receives special tax proceeds in an amount less than 95% of the amount needed to pay that year's principal of and interest on the bonds, and will cause such foreclosure actions to be diligently pursued to completion. However, the district also may elect to defer foreclosure proceedings on any parcel if the amount in the reserve fund is not less than the reserve requirement[6]. If a judicial foreclosure sale were to occur, there is no assurance that the real property subject to that sale will be sold or if sold, that the proceeds of such sale will be sufficient to pay the

[6] Calculated as the lesser of three tests, i.e. the lesser of (i) 10% of the outstanding principal amount of the bonds, (ii) maximum annual debt service on the outstanding bonds, or (iii) 125% of average annual debt service on the outstanding bonds.

delinquent special tax installment. In such cases, if the reserve fund is depleted, there could be a default or delay in the payment to the owners of the Bonds, since foreclosure by court proceedings is subject to litigation delays. Hence, although a judicial foreclosure action can be commenced, there is no assurance that it will be completed or that it will be completed in a timely manner.

In the event of an unsuccessful foreclosure sale, the district may pursue other alternatives such as workout opportunities, for example. In a workout, an investor buys the bonds at a deep discount but for that to occur, there needs to be a compromise between all participants, which is often hard to achieve.

2 Motivation

In some instances, due to heterogeneity of the owners of the property within a CFD (or the pieces of land they own), a few land owners might default, while others continue their regular payment of special taxes. In such cases, a foreclosure sale is initiated against only the delinquent parcels. In the mean time, the shortfall in special taxes is covered by an increase in the special taxes levied on the non-delinquent parcels, up to the maximum rate pursuant to the Rate and Method of Apportionment. If a foreclosure sale fails, the issuing agency will analyze other available alternatives for curing the default. For instance, it will consider a settlement agreement with a potential new developer who promises to buy the property and bring all delinquencies current. Such agreement, however, might be accompanied by certain expectations on behalf of the new property owner that might lead to a conflict situation involving several parties: the new owner, the existing owners, the issuing agency, etc. In certain instances, it might be very difficult to achieve a compromise among all parties.

This paper was motivated by a real life case of a defaulted CFD and translates that example into a simple model of the strategic behavior and interaction among the participants in a CFD. The CFD bonds were issued in the early 1990s to finance the acquisition and construction of certain public improvements, including roads, flood control facilities, sewer and park and open space facilities. At the time of sale, only one of the lots in the district was in a graded and finished condition and there was a very high concentration of ownership. The appraised value of the district was four times the aggregate principal amount of the issued bonds. The developer's intention was to develop its property primarily for commercial uses, with potential subsequent transfers of ownership of the property within the district prior to the completion of the project. At the time of bond sale, the developer had completed one office building and planned to have four additional buildings completed by the end of the first year (which would have constituted approximately 20% of the parcels to be developed in the district). The entire project was expected to be completed within approximately ten years. However, due to a number of reasons, the unimproved parcels did not get developed as planned and in ten years, 93% of the property still remained undeveloped. The owners of the revenue producing buildings continued to pay their special taxes but the tax burden for the property owners of about 86% of all parcels in the district (the non-developed parcels) became too high when they could not develop their property and they defaulted on their special tax payments. The Superior Court appointed a receiver who represented the owners of secured notes of property located in the district, and subsequently ordered the approval of a new developer to acquire the property from the current owners. Pursuant to a settlement agreement between the district and that developer, the developer agreed to pay the delinquent taxes and legal expenses in exchange for the district removing the next year's special tax levy from the tax bill, waiving penalties, interest and costs related to the delinquent special taxes and dismissing the foreclosure proceedings filed on the property. The developer purchased the property for its market value absent the debt. Subsequently, a restructuring of the district was in the process of occurring[7] with change proceedings and new Rate and Method of special tax to be adopted. The proposed restructuring created a conflict for the existing property owner who had always paid his taxes on a timely basis and was initially opposed to the new structure. The next section describes the model and each owner's resulting response under each scenario.

3 The Model

The purpose of our stylized model is to explore the situation of *curing*[8] partial default. Partial default occurs when some of the owners of the land decide to default on their special tax payments, while other owners prefer to continue the payments on a timely basis. In that case, the default can be cured by selling the defaulted property to new

[7] In line with the ability to refinance the existing debt to reduce the annual debt service.

[8] Resolving default through foreclosure sale, settlement agreement, or other legally available rights and remedies for enforcement of a bond contract and restoring the regular payment of interest and principal on the bonds.

owners[9]. The new owners are allowed to negotiate with the County on a new schedule of tax payments, which, if adopted, will affect also the old owners. Typically, new schedules involve an extension of the final maturity date of the bonds issued to finance the particular project, which implies extending the term of special tax payments for the old owners. This situation may adversely affect their payoffs, which creates a potential conflict that we explore in game-theoretic terms below.

The *partial* default considered here may occur, for example, because of the owners' heterogeneity in income or investment decisions. In our model, however, we do not look into the factors that caused the default occurrence. That is, we assume that the default event is exogenous and happens at some given moment $t_d > 0$. Also, for simplicity, we assume that initially (at $t = 0$) there are only two pieces of property, *a* and *b*, that belong to two owners, A and B1, respectively. Owner A is the one who will later continue her tax payments[10], and owner B1 is the one who will default .

For the purpose of our model, we assume that at moment $t = 0$ owners A and B1 own two different pieces of property and have different development plans for improving their property. Both A and B1 make non-transferable investments related to the land they own and the development plans they have in mind. Some of those might include, for example, costs associated with engineering and hydrological studies, obtaining necessary permits and entitlements, etc. However, as time passes by, market conditions change and there is

[9] The County sells the defaulted properties at foreclosure sales.
[10] We assume that owner A is not willing to or able to buy owner B1's land when B1 defaults. That might be the case for a number of reasons: B1's land is planned for development or is developed in such a way that does not fit owner A's specialization or A is simply not interested.

an idiosyncratic shock that affects owner B1's property in that there is no longer demand for the type of product owner B1 had planned for. As a result, owner B1's project construction and sales do not proceed according to plan and she is unable to meet her scheduled special tax payments. Consequently, at moment $t = t_d$ owner B1 defaults on her payments, and the new owner, B, purchases the defaulted property[11]. Owner B may prefer to implement a new schedule of payments, under which the final payment term is extended by a fixed number of years to T_2 (typically $T_2 > T_1$). Also, the new schedule of payments involves a new tax rate (set by the County if the proposal is approved). This reflects the fact that a new structure is proposed for the development project that contemplates the refinancing of the still outstanding debt by issuing new bonds. The new schedule of payments must be approved by the County. In case of approval, it is proposed to individual A.

B's development plan for the defaulted property she purchases is different from B1's original plan, since market conditions have changed and B's plan is in accordance with the new economic environment. Thus, all investments previously made by B1 for her original development purpose are now worthless to B, who has to start the development of her property from the very beginning and undertake new engineering and hydrological studies, change the zoning and use of her property, obtain new permits and entitlements, and thus make investments that match her development plan and her newly proposed project. As a result, owners A and B have different investments. Owner A has invested

[11] In reality, as we described in the Background section, there is always a gap between the moment in which the default occurs and the time it is actually cured. For simplicity, however, in our model we assume that the default is cured immediately. This does not impact the results, since the equilibria we derive will be the same even if we assumed that default occurred at moment t_d and was cured at moment ${}_ct_d$.

previously and the development of her product is moving along, which implies that she now has to incur relatively less costs in investing going forward as opposed to owner B who needs to start from scratch in developing the property she purchased.

Under a more general scenario, we can assume that owners A, B1, and B are identical and have identical development plans and initial ability. Owner A and B1 both buy property and start to develop it, in the process of which they make non-transferable investments. This is very much in line with the literature on hold-up costs and insider versus outsider wages, in which two entrepreneurs invest time and resources in their personal knowledge of what they will do to operate the investment. Then, all of a sudden, there is an idiosyncratic economic shock such that owner B1 no longer wants or is no longer able to continue owning and developing her property. Consequently, she defaults and owner B buys the property. Even though owners A and B are ex ante identical and would have had the same costs had they started at the same time, due to the fact that owner A has already made some investments that owner B has yet to make (since owner B1's investment cannot be transferred to owner B due to the match between B1 and her initial project), owners A and B will have different maximization calculuses going forward.

Thus, as a result of the heterogeneity in investment decisions and the market shocks that occur between the time of initial investment and the moment of default, the expected payoffs of owners A and B calculated at moment t_d when the conflict situation may arise may be different and we treat them as parameters in our model. Let $\pi_{t_d}^{a}$ and $\pi_{t_d}^{b}$ [12]denote the corresponding payoffs of owners A and B when no change in the schedule of tax payments in proposed (i.e., when the originally existing scheme of tax payments continues). If the change in the schedule of tax payments is implemented, the expected payoffs of the two owners change correspondingly to $\tilde{\pi}_{t_d}^{a}$ and $\tilde{\pi}_{t_d}^{b}$. The expected payoffs $\pi_{t_d}^{a}$ and $\pi_{t_d}^{b}$ reflect owner A's and owner B's expectations about the dynamics of the corresponding markets between moments t_d and T_1 when the original tax schedule is in place, while the expected payoffs $\tilde{\pi}_{t_d}^{a}$ and $\tilde{\pi}_{t_d}^{b}$ take into account the owners' expectations about the dynamics of the corresponding markets between moments t_d and T_2 when the new schedule of tax payments has been implemented. Consequently, what matters for decision-making are the gains in player A's and player B's profit, $G^a = \tilde{\pi}_{t_d}^{a} - \pi_{t_d}^{a}$ and $G^b = \tilde{\pi}_{t_d}^{b} - \pi_{t_d}^{b}$, respectively, if the change in the schedule of tax payments is implemented. These gains will enter as the key parameters in our model. Ultimately, the key decision to be made by owner B of whether or not to propose the change in tax payments and the key decision of owner A of whether to accept or reject the proposed change in the schedule of tax payments are influenced by these net gains and other parameters that are introduced below.

[12] One can think of several ways of parameterizing these expected payoffs. For example, they can be calculated using an "asset-pricing" like model with parameters such as a discount rate, a tax rate, and a volatility parameter. Such and other similar parameterizations, however, require very restrictive assumptions while the overall number of parameters does not decrease. Therefore, for the purposes of clarity and generality, we opt to treat the expected profits themselves as parameters of our model.

4 The game

We model the conflict situation that arises when there is an attempt to cure default by a three-stage game. At stage 1 the new owner, player B, decides if she wants to implement the change in the schedule of payments. At stage 2 the incumbent player, player A, can either accept the change, or decide to go to court. At stage 3, which happens if player A decides to go to court, both players simultaneously choose their court expenditures, and the court makes its decision.

We will analyze all possible subgame-perfect Nash equilibria (SPNE) in pure strategies. We start with the subgame of stage 3, when the players choose their court investments. The court makes a decision YES, that is, in favor of the proposed change, or NO, that is, against the proposed change. Let (c_a, c_b) denote pairs of court expenditures of players A and B. For simplicity we assume that each player can either spend a large cost of C or a small cost of c, with $C > c > 0$. Let p denote the probability that the court makes the YES decision provided both players spend c. We call this situation the "unbiased court." We also assume that the court stays unbiased if both players spend the same amount C. Thus,

$$\Pr\{YES \mid (c,c)\} = \Pr\{YES \mid (C,C)\} = p .$$

The court becomes "biased in favor of B", i.e. is more likely to decide YES on the change, if player A spends c while player B spends C. Similarly, the court becomes "biased in favor of A", i.e. is less likely to decide YES, if player A spends C while player B spends c. We model this by assuming that

$$\Pr\{YES \mid (c,C)\} = p+\alpha, \qquad \Pr\{YES \mid (C,c)\} = p-\alpha .$$

Parameter $\alpha \in [0, \min\{p, 1-p\}]$ describes the magnitude of the court bias associated with cost difference $C-c$.

Note that if $G^b \le 0$, player B will not propose the change at stage 1. Also, if $G^a \ge 0$, player A will accept the change at stage 2. Thus, a necessary condition for stage 3 to occur is

$$G^a < 0 \text{ and } G^b > 0 . \tag{*}$$

In what follows we assume that condition (*) holds. Now let

$$\Pi^a(0,0) \equiv \Pi^a = p\tilde{\pi}^a_{t_d} + (1-p)\pi^a_{t_d}\ , \quad \Pi^b(0,0) \equiv \Pi^b = p\tilde{\pi}^b_{t_d} + (1-p)\pi^b_{t_d},$$

denote expected profits of players A and B at stage 3 when they both spend nothing for the court. When both players spend c or C the court is unbiased but the expected profits will decrease by c or C:

$$\Pi^a(c,c) = \Pi^a - c, \qquad \Pi^b(c,c) = \Pi^b - c,$$

or

$$\Pi^a(C,C) = \Pi^a - C, \qquad \Pi^b(C,C) = \Pi^b - C$$

When the court is biased, the expected profits will be either

$$\Pi^a(c,C) = (p+\alpha)\tilde{\pi}^a_{t_d} + (1-p-\alpha)\pi^a_{t_d} - c = \Pi^a + \alpha G^a - c$$

and

$$\Pi^b(c,C) = (p+\alpha)\tilde{\pi}^b_{t_d} + (1-p-\alpha)\pi^b_{t_d} - C = \Pi^b + \alpha G^b - C,$$

or

$$\Pi^a(C,c) = (p-\alpha)\tilde{\pi}^a_{t_d} + (1-p+\alpha)\pi^a_{t_d} - C = \Pi^a - \alpha G^a - C$$

and

$$\Pi^b(C,c) = (p-\alpha)\tilde{\pi}^b_{t_d} + (1-p+\alpha)\pi^b_{t_d} - c = \Pi^b - \alpha G^b - c\,.$$

Figure 1 shows the subgame of stage 3 in its normal form. It is a 2×2 game where each pair of strategies can potentially be Nash equilibrium (NE).

	c	C
c	$\Pi^a - c,\ \Pi^b - c$	$\Pi^a + \alpha G^a - c,\ \Pi^b + \alpha G^b - C$
C	$\Pi^a - \alpha G^a - C,\ \Pi^b - \alpha G^b - c$	$\Pi^a - C,\ \Pi^b - C$

Figure 1. Subgame of stage 3 in the normal form. Player A is the row player, while player B is the column player.

Equilibria of stage 3 subgame

(c,c) is a NE when $C - c > -\alpha G^a$ and $C - c > \alpha G^b$. In other words, in this case the cost of biasing the court is so high for both owners A and B that they do not want to incur that cost and invest the minimal amount when they go to court.

(c,C) is a NE when $-\alpha G^a < C - c < \alpha G^b$, i.e. for player A the cost of biasing the court is still high, while for player B it is not so high. Since $C - c > 0$, it follows that $-G^a < G^b$, i.e. B's gain is greater than A's loss.

(C,c) is NE when $\alpha G^b < C - c < -\alpha G^a$, which also implies that $-G^a > G^b$, i.e. A's loss is greater than B's gain from the proposed change.

(C,C) is NE when $C - c < -\alpha G^a$ and $C - c < \alpha G^b$, i.e. the cost of biasing the court is sufficiently low for both players.

We now proceed with backward induction to stage 2. In the stage 2 subgame, player A decides if she prefers to go to court or simply accept the change. To make this decision, player A compares the expected payoff of going to court with $\tilde{\pi}^a_{t_d}$, her payoff after the change.

Equilibria of stage 2 subgame

(*c*,*c*). When $C - c > -\alpha G^a$ and $C - c > \alpha G^b$, player A's expected equilibrium payoff of going to court is $\Pi^a - c$. There are two possibilities:

(a) $\Pi^a - c > \tilde{\pi}^a_{t_d}$, i.e. $(1-p)G^a < -c$. Also, $C - c > -\alpha G^a$ in this equilibrium, and we obtain $\frac{c}{1-p} < -G^a < \frac{C-c}{\alpha}$ (recall that $G^a < 0$). Player A will go to court and spend *c* if her expected loss is sufficiently big compared to *c*, but not too big to have to bias the court. Note that this equilibrium only exists if $c\alpha < (C-c)(1-p)$.

(b) $\Pi^a - c \le \tilde{\pi}^a_{t_d}$ i.e. $(1-p)G^a \ge -c$. In this case $-G^a < \min\left\{\frac{c}{1-p}, \frac{C-c}{\alpha}\right\}$, i.e. player A's loss from the change is small, and she will opt not to go to court at all.

(*c*,*C*). When $-\alpha G^a < C - c < \alpha G^b$, player A compares $\Pi^a + \alpha G^a - c$ and $\tilde{\pi}^a_{t_d}$. We have

(a) $\Pi^a + \alpha G^a - c > \tilde{\pi}^a_{t_d}$, i.e. $(1-p-\alpha)G^a < -c$, and from $-\alpha G^a < C - c$ it follows that $\frac{c}{1-p-\alpha} < -G^a < \frac{C-c}{\alpha}$, and it must be that $c\alpha < (C-c)(1-p-\alpha)$. In this case player A will go to court and spend *c*.

(b) $\Pi^a + \alpha G^a - c \le \tilde{\pi}^a_{t_d}$, i.e. $(1-p-\alpha)G^a \ge -c \Rightarrow -G^a < \min\left\{\frac{c}{1-p-\alpha}, \frac{C-c}{\alpha}\right\}$.

In this case player A will not go to court.

(*C*,*c*). When $\alpha G^b < C - c < -\alpha G^a$, player A compares $\Pi^a - \alpha G^a - C$ and $\tilde{\pi}^a_{t_d}$. We have

(a) $\Pi^a - \alpha G^a - C > \tilde{\pi}^a_{t_d}$, i.e. $(1-p+\alpha)G^a < -C$, and from $-\alpha G^a > C - c$ it follows that $-G^a > \max\left\{\frac{C}{1-p+\alpha}, \frac{C-c}{\alpha}\right\}$. In this case player A will go to court and spend *C*.

(b) $\Pi^a - \alpha G^a - C \leq \tilde{\pi}^a_{t_d}$, i.e. $(1-p+\alpha)G^a \geq -C \Rightarrow \frac{C-c}{\alpha} < -G^a \leq \frac{C}{1-p+\alpha}$, and necessarily $(C-c)(1-p+\alpha) < \alpha C$. In this case player A will not go to court.

(*C*,*C*). When $C - c < -\alpha G^a$ and $C - c < \alpha G^b$, player A compares $\Pi^a - C$ and $\tilde{\pi}^a_{t_d}$:

(a) $\Pi^a - C > \tilde{\pi}^a_{t_d}$, i.e. $(1-p)G^a < -C$. Also, $C - c < -\alpha G^a$, and we obtain $-G^a > \max\left\{\frac{C}{1-p}, \frac{C-c}{\alpha}\right\}$. Player A will go to court and spend *C*.

(b) $\Pi^a - C \leq \tilde{\pi}^a_{t_d}$, i.e. $(1-p)G^a \geq -C \Rightarrow \frac{C-c}{\alpha} < -G^a \leq \frac{C}{1-p}$ and it must be that $(C-c)(1-p) < \alpha C$. In this case, player A will not go to court.

Thus, in all subgame perfect Nash equilibria (SPNEs), if stage 2 is reached, there are two possibilities: (a) player A will choose to go to court and (b) player A will not. The corresponding conditions on the parameters conform to the intuition.

We complete backward induction by analyzing stage 1. In the stage 1 subgame, player B decides whether she proposes the change in the schedule of tax payments or leaves the schedule unchanged. Knowing that player A will in some circumstances go to court if the change is proposed (we still assume at this point that the "conflict condition" (*) holds), player B needs to compare her corresponding payoff at stage 3 with $\pi^b_{t_d}$, her expected payoff if no change is implemented.

Equilibria of stage 1 subgame

(*c*,*c*)(a). When $C - c > \alpha G^b$ and $\frac{c}{1-p} < -G^a < \frac{C-c}{\alpha}$, player B's expected equilibrium payoff of going to court is $\Pi^b - c$. There are two possibilities:

(1) $\Pi^b - c > \pi^b_{t_d}$, i.e. $pG^b > c$. Player B's expected gain from the change exceeds her court expenditures. Also $C - c > \alpha G^b$, i.e. $\frac{c}{p} < G^b < \frac{C-c}{\alpha}$, i.e. player B's gain is not too big to bias the court. In this case player B will go for the change, and spend c in the court.

(2) $\Pi^b - c \le \pi^b_{t_d}$, i.e. $pG^b \le c$ and $G^b < \min\left\{\frac{c}{p}, \frac{C-c}{\alpha}\right\}$. In this case player B's gain is too small, and she will not propose the change.

(*c*,*c*)(b). When $C - c > \alpha G^b$ and $-G^a < \min\left\{\frac{c}{1-p}, \frac{C-c}{\alpha}\right\}$, player A will not go to court, i.e. player B will always propose the change provided condition (*) holds.

(*c*,*C*)(a). When $C - c < \alpha G^b$ and $\frac{c}{1-p-\alpha} < -G^a < \frac{C-c}{\alpha}$, player B compares $\Pi^b + \alpha G^b - C$ and $\pi^b_{t_d}$. We have

(1) $\Pi^b + \alpha G^b - C > \pi^b_{t_d}$, i.e. $(p+\alpha)G^b > C \Rightarrow G^b > \max\left\{\frac{C}{p+\alpha}, \frac{C-c}{\alpha}\right\}$. In this case player B will propose the change and spend C in the court.

(2) $\Pi^b + \alpha G^b - C \le \pi^b_{t_d}$, i.e. $(p+\alpha)G^b \le C \Rightarrow \dfrac{C-c}{\alpha} < G^b \le \dfrac{C}{p+\alpha}$. Player B will not propose the change.

(*c*,*C*)(b). When $C - c < \alpha G^b$ and $-G^a < \min\left\{\dfrac{c}{1-p-\alpha}, \dfrac{C-c}{\alpha}\right\}$, player A will not go to court, i.e. player B will propose the change under (*).

(*C*,*c*)(a). When $\alpha G^b < C - c$ and $-G^a > \max\left\{\dfrac{C}{1-p+\alpha}, \dfrac{C-c}{\alpha}\right\}$, player A will go to court, i.e. player B has to compare $\Pi^b - \alpha G^b - c$ and $\pi^b_{t_d}$. We have

(1) $\Pi^b - \alpha G^b - c > \pi^b_{t_d}$, i.e. $(p-\alpha)G^b > c$, hence $\dfrac{c}{p-\alpha} < G^b < \dfrac{C-c}{\alpha}$. In this case player B will propose the change and spend *c* in the court.

(2) $\Pi^b - \alpha G^b - c \le \pi^b_{t_d}$, i.e. $(p-\alpha)G^b \le c$, hence $G^b < \min\left\{\dfrac{C-c}{\alpha}, \dfrac{c}{p-\alpha}\right\}$. In this case player B will not propose the change.

(*C*,*c*)(b). When $\alpha G^b < C - c$ and $\dfrac{C-c}{\alpha} < -G^a \le \dfrac{C}{1-p+\alpha}$, player A will not go to court, i.e. player B will propose the change under (*).

(*C*,*C*)(a). When $C - c < \alpha G^b$ and $-G^a > \max\left\{\dfrac{C}{1-p}, \dfrac{C-c}{\alpha}\right\}$, player A will go to court, therefore player B needs to compare $\Pi^b - C$ and $\pi^b_{t_d}$. We have

(1) $\Pi^b - C > \pi^b_{t_d}$, i.e. $pG^b > C$. Then $G^b > \max\left\{\dfrac{C-c}{\alpha}, \dfrac{C}{p}\right\}$. In this case player B will go for the change, and spend *C* in the court.

(2) $\Pi^b - C \le \pi^b_{t_d}$, i.e. $pG^b \le C$ and $\frac{C-c}{\alpha} < G^b \le \frac{C}{p}$. In this case player B will not propose the change.

(*C*,*C*)(b). When $C - c < \alpha G^b$ and $\frac{C-c}{\alpha} < -G^a \le \frac{C}{1-p}$, player A will not go to court, and player B will always propose the change.

5 Discussion

As we showed in the previous section, there are three types of Subgame Perfect Nash Equilibria under condition (*):

(i) Equilibria (c,c)(a)(1), (c,C)(a)(1), (C,c)(a)(1), (C,C)(a)(1) are the SPNEs where player B proposes the change despite player A's threat to go to court. Then player A goes to court (the threat is credible), and the players spend the corresponding amounts.

(ii) Equilibria (c,c)(a)(2), (c,C)(a)(2), (C,c)(a)(2), (C,C)(a)(2) are the SPNEs where player B proposes no change because player A's threat to go to court is credible, and the resulting expected gain of player B is not sufficient to cover court expenses.

(iii) Equilibria (c,c)(b), (c,C)(b), (C,c)(b), (C,C)(b) are the SPNEs where player A's threat to go to court is not credible, i.e. player B always proposes the change, and A accepts it.

Eventually, all equilibria are the result of players A and B performing a cost-benefit analysis in every case and making decisions based on their corresponding expected gains, the influence of the court and the expected expenditures they would incur if they choose to go to court.

If we were to analyze the equilibria from a social point of view, we need to take into consideration that in our model the default event is exogenous. The fact that the property defaulted means that something went wrong and thus socially there are likely to be reasons for something to be changed (e.g., payments to be changed, restructured). Recall that B's development plan for the defaulted property she purchases is different from B1's original plan and is in accordance with the new economic environment. Thus, assuming that B's plan will provide such a change, we can assume that socially good equilibria are the ones for which B's plan is implemented. This implies that the second set of equilibria, (ii), is not one of them.

Another consideration for what constitutes "good" equilibria takes into account the time and costs associated with going to court (lobbying, rent seeking, etc.). Those are unnecessary social costs that make more difficult and delay the curing of default and the successful development of the project. Thus, it appears that socially optimal outcome is the one in which the players do not go to court. Looking at our three types of Subgame Perfect Nash Equilibria, the first set of equilibria, (i), involves social costs related to going to court and thus is socially not optimal. Thus, the third set of equilibria is socially optimal, since it results in the implementation of the change proposed by player B, does not involve unnecessary costs in going to court and leads to a more timely resolution of the partial default.

This set of equilibria can be induced by policy actions affecting the following parameters of our model: C, c, p, and α. Recall that α describes the magnitude of the court bias associated with cost difference $C - c$ and therefore in some sense measures the level of corruption. When α is decreased along with increasing $C - c$ or c, it becomes very costly to bias the court, i.e. the level of corruption is low and this type of equilibria is more likely to occur.

Parameter p in our model reflects that the court is unbiased, i.e. it reflects the quality of the argument from the County's side that the proposed change is beneficial. To increase p is costly (if there is court, the County spends public money to prove that the change is justified), thus the credibility of the County's decision to approve the new schedule of payments must be high. This implies that issuers should carefully evaluate various alternatives for curing partial default to ensure the best option is chosen. Since the County in our model approves the change proposed by player B, this should serve as a signal to player A that if that is the case, the change is beneficial and the court will also approve it or it will be very costly for player A to invest in trying to alter the court decision.

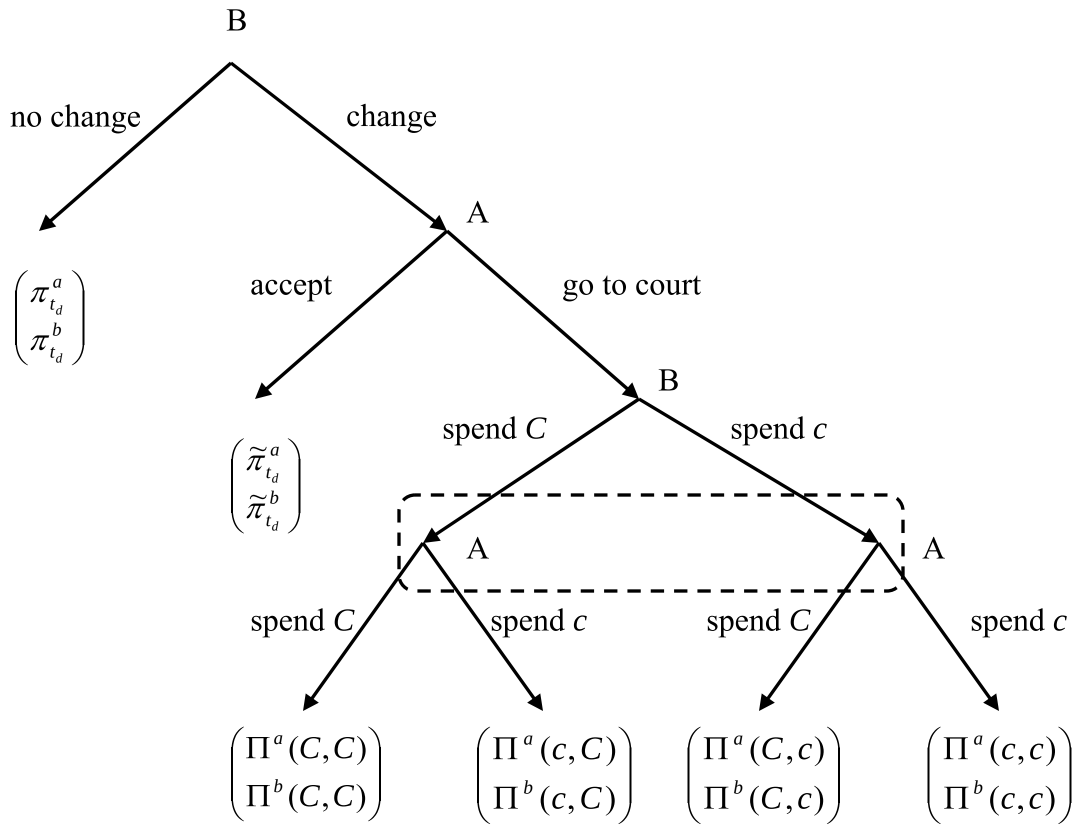
6 Conclusion

Our *stylized* model explores the situation of curing partial default and the potential conflicts that might arise between the new owner taking over the defaulted property and the previously existing property owners who have never been delinquent in their special tax payments. Since each party has a different agenda and defends its own interest, a conflict situation might occur, which we analyze from a game-theoretical perspective to obtain the subgame-perfect Nash equilibria. The results we arrive at are quite intuitive. Every equilibrium is a result of interplay between expected gains from introducing and accepting a change in the schedule of tax payments and possible losses due to going to court and investing in the court decision.

This model can be used to analyze the interaction among all participants in a workout or a settlement aiming at curing a "partially defaulted" issue and their optimal behavior, given certain conditions, which might provide useful insights to both the issuer (the public agency) and the developers involved on how to most efficiently structure such transactions.

There are many ways to extend this model, one of which is to endogenize the default occurrence and analyze the factors that caused it. This, however, is the subject of another paper which studies the factors that influence default. Other important assumptions are the owners' risk neutrality and exogeneity of the legislative process and taxation. Other possible extensions might consider the opportunity to delay investments, as well as the introduction of public goods properties in our model.

Figure 2: The Game Tree



Determinants of the default and redemption of the non-rated Community Facilities District (Mello-Roos) bonds in California

Abstract

In this essay we build upon previously existing statistical models of high yield corporate bonds to determine the major factors that contribute to the default or redemption of non-rated CFD bonds. We refine the variables utilized in other studies to capture the specific characteristics of the non-rated Mello-Roos market in California. Our model incorporates the aging effect and various macroeconomic factors that affect the California non-rated land secured market. We have used the multinomial logit model to determine the relative importance of each of these factors on the change in the status of a CFD bond from "normal" to redeemed or defaulted. Our results show that age is significant both for the redemption and the default of a bond, with younger bonds more likely to default and less likely to be redeemed and older bonds more likely to be redeemed and less likely to default. In addition, a weaker economy is more likely to lead to more defaults and less redemptions among outstanding non-rated Mello-Roos bonds.

Keywords: Mello-Roos, CFD, bonds, multinomial logit
JEL: C33, D53, H74

1 Introduction

In the earlier essays we described the default experience of the non-rated land secured bond market in California during the period 1985-2004. We specifically discussed the impact of various economic factors and policy changes[1] on the performance and default history of the non-rated Mello-Roos (CFD)[2] bonds. As a next step, we built a model that explored the strategic behavior and interaction of the participants involved with a community facilities district in *curing* a partial default and discussed their optimal behavior given certain conditions. However, in both of the prior essays we did not focus on determining the relative importance of each of the various factors in explaining the default occurrence of the non-rated CFD bonds. In fact, our stylized model assumed that the default event was exogenous.

In this essay we build upon previously existing statistical models of high yield corporate bonds to determine the major factors that contribute to default, as well as redemption, of non-rated CFD bonds. We refine the variables utilized in other studies to capture the specific characteristics of the non-rated Mello-Roos market in California. Our model incorporates the aging effect and the state of the economy as measured by the number of residential building permits issued, the total value of non-residential development, and the 10-year Treasury rate, as well as the total outstanding indebtedness of the issuers of non-rated CFD bonds and the effect of the change in legislation with regard to annual

[1] Such as employment, residential building permit issuance, interest rates and other macroeconomic indices, as well as the S.E.C. Rule 15c2-12(b)(5) that required annual disclosure reports to be filed by all issuers of Mello-Roos bonds sold after July 1, 1995.

[2] Bonds secured by special taxes levied to finance public infrastructure in California. For more details please refer to Section II of Essay I.

reporting for bonds issued after July 1, 1995. We have used the multinomial logit model to determine the relative importance of each of these factors on the change in the status of a CFD bond from "normal"[3] to redeemed or defaulted.

The essay is organized as follows: in the next section, we review the existing default literature, then describe the data we have utilized in our analysis and present the model. Further, we continue with a discussion of the empirical results obtained and a summary conclusion of the findings of our study.

2 Review of the Existing Literature

Numerous studies have looked for an explanation of the fluctuations in default rates, trying to determine the major factors that contribute to the variation in default occurrence. Fons (1991), Helwege and Kleiman (1996), Jonsson and Fridson (1996), Jonsson, Fridson, and Zhong (1996), among others, developed statistical models which identified that default was influenced by three major factors: credit quality, the state of the economy, and the age of the bonds under investigation.

The regression equation used by Fons included only two of these factors, credit quality and macroeconomic conditions, and found that over half of the variation in default rates over time could be explained using those factors. To model credit quality, Fons used the credit ratings of the bonds he studied, tracking the distribution of issuers within each

[3] If a bond is issued in year zero with a scheduled maturity in year N, for all t<N, the bond is outstanding and if t=N, the bond matures. Thus, we define the status of a bond as "normal" if the bond is outstanding for all t<N or the bond matures if t=N.

rating category over time. He then multiplied that distribution by the historical average one-year default rate for each rating category and obtained the annual expected default rate for the high yield market. The Blue Chip median GNP growth forecasts at the start of each year from 1977 through 1991 was another explanatory variable in his model that served as a proxy for how default is impacted by macroeconomic effects. The results obtained by Fons showed that variation in actual default rates is negatively correlated with changes in the real GNP and positively correlated with changes in "expected" default rates.

Later studies built upon Fons model. Helwege and Kleiman (1996), for example, recognized that few defaults occurred in the first few years after issuance and that defaults were, in fact, most likely to occur three years after the bonds have been issued. To account for that, their model incorporated the so-called "aging factor", which measured the impact of the length of time that risky bonds were outstanding on the default rate. The aging effect was modeled by adding an explanatory variable representing "the dollar amount of B3-rated issues outstanding lagged three years". In addition, the authors also suggested that default rates were not symmetrically affected by changes in macroeconomic factors. They argued that the effect of a decline in the GDP growth below a certain threshold would impact investment-grade bonds less than bonds from the speculative-grade category. In order to measure that effect, Helwege and Kleiman added a recession indicator variable that equaled one if GDP growth was equal to or fell below 1.5%. They further formed an interaction variable by multiplying the recession indicator variable by the expected default rate (as measured in the Fons model).

Using the newly formed interaction variable, Helwege and Kleiman showed that a high fraction of lower rated bonds issued in the high yield market is more likely to lead to an increase in default rates in the case of an economic downturn than the "distribution of higher tier speculative grade credits."

Jonsson and Fridson (1996) and Jonsson, Fridson, and Zhong (1996) further extended the model introduced by Fons in 1991 by developing a statistical framework similar to that of Helwege and Kleiman. They, too, studied the three major factors influencing default: credit quality, the state of the economy, and the aging effect. The independent variables in their models were able to explain almost 87% of the variation in the annual default rates of Moody's speculative-grade bonds. Jonsson and Fridson's model combined two factors in one variable, "the fraction of high yield bond issuance rated B3 or lower by Moody's lagged by three years", which measured simultaneously the aging effect[4] and the credit quality[5]. In addition, the authors used different proxies for the macroeconomic effects that were "more closely tied to the financial health of corporations" and thus had greater explanatory power – corporate profits and the liabilities of failed businesses. Jonsson, Fridson, and Zhong (1996), on the other hand, further extended these models by including variables[6] which attempted to "assess the investor optimism in the market" and "the accessibility of the equity markets as alternative or supplemental sources of financing for risky borrowers," rather than measure the state of the economy. Their study

[4] As represented by the lag.
[5] As measured by the fraction of low rated bonds.
[6] Those variables included the NASDAQ price-to-earnings ratio, the Standard & Poor's price-to-earnings ratio, the difference between the S&P price-to-earnings ratio and the NASDAQ price-to-earnings ratio, and gross proceeds of initial public offerings (IPOs).

showed that default rates were inversely related to successful IPOs and high price-to-earnings ratios.

The subject of all these studies is the fluctuation in the default rates and the default occurrence of high-yield corporate bonds. All of them show that macroeconomic conditions, credit quality differences, and the age of the bonds impact defaults. To our knowledge, how such factors affect the default of the non-rated Mello-Roos bonds in California has not been analyzed. In the following sections, we examine the factors affecting the default occurrence of the non-rated CFD bonds and build upon these previous models by refining the variables used to better reflect the characteristics of the non-rated land-secured market in California. Our model incorporates the aging effect, the state of the economy, and the policy change introduced in 1995. In addition, we use regression analysis to determine the relative importance of each of the factors in explaining the change in the status of the evaluated CFD bonds from "normal" to redeemed or defaulted.

3 The Data

We create an unbalanced panel data set, the spatial dimension of which pertains to a set of non-rated CFD bonds that were either issued or outstanding during the period 1990-1997. As we demonstrated in our first essay, the number of actual defaults of non-rated CFD bonds was small compared to the total issuance for that period, with 78% of all defaults occurring prior to 1998. Given that and the fact that we did not have sufficient information[7] to utilize data for the entire period 1985-2004, we focus only on the period 1990-1997, which we feel provides significant representation of the non-rated Mello-Roos market in California[8]. The temporal dimension of our panel data set pertains to the periodic observations of the following variables characterizing the non-rated CFD bonds over the eight-year period under investigation: new residential building permit issuance, total nonresidential valuation (which we adjust for inflation and transform in 1990-dollars to make it comparable across time), employment, 10-year Treasury rate, the age of each bond in each year under investigation, as well as total outstanding long-term debt of the issuers of the non-rated bonds (again calculated in 1990-dollars).

We have utilized numerous sources in order to compile the data in our panel. Issuance and default data were collected from the California Debt and Investment Advisory Commission (CDIAC) at the State Treasurer's Office, California Tax Data, Income Securities Advisors, Inc., Securities Data, the Bond Buyer, the Municipal Bond Advisor, and numerous industry professionals such as the corporate trust departments of banks acting as trustees or fiscal agents, underwriting and bond counsel firms, and Fieldman, Rolapp & Associates. The information received included pertinent default and issuance information as well as redemption and maturity dates, where applicable. Each defaulted transaction is counted only once, at the first time of default occurrence, and is dropped

[7] Such as the total outstanding indebtedness of the issuers of non-rated CFD bonds.
[8] Furthermore, the bonds issued in the early years, prior to 1990, are captured in the data we examine, reflecting the time that has elapsed from their issuance date to the date of analysis. This is the case, since, as we showed in our first essay (and particularly, in Table 2), there were no defaults and redemptions of non-rated CFD bonds between 1985 and 1990.

from the sample afterwards[9]. This is consistent with the methodology used in existing default studies and in the mortality rate analysis in our first essay.

The macroeconomic data in our sample is on a per County basis and was gathered from a variety of sources such as the California Employment Development Department, California Department of Finance, the Construction Industry Research Board, the U.S. Department of Commerce, Bureau of the Census, the U.S. Bureau of Labor, the Bond Buyer Yearbooks, the Labor Market Information Division, etc. Information on the indebtedness of the bond issuers was obtained from the Census of Local Governments for the period being analyzed.

4 The Model

4.1 Specification

We use a sample of 571 individual non-rated CFD transactions (i.e. 571 individual groups) that were issued or outstanding in the bond market at any time during the period January 1990 – December 1997, resulting in an unbalanced panel data set comprised of 2,985 observations. Based on the sample data, we calculate the age of the bond transaction in each year under investigation as compared to the date of its initial issuance. We further track the "status" of each issue *i* in each year *t*, i.e. if it is "normal" (i.e., was outstanding or matured), was refunded, or defaulted in year *t*. Thus:

[9] The same holds true for redeemed bond issues; they were dropped from the sample after the redemption occurred.

$$
Status_{it} = \begin{cases} 0 \text{ if bond issue } i \text{ is outstanding or matures in year } t^{10}; \\ 1 \text{ if bond issue } i \text{ is redeemed in year } t; \\ 2 \text{ if bond issue } i \text{ defaults in year } t. \end{cases}
$$

Since more than two different scenarios are possible, we build a multinomial logit model that allows each of the three different alternatives to be considered at the same time. The three scenarios imply that we need two dummy variables to describe the resulting status, with each dummy equaling one only when that particular case has occurred. In our model we select status = 0 as the "base" alternative, so we compare each other status case to this base alternative with a logit equation. Since there are three different alternatives, there are two different logit equations in our multinomial logit model system, with the dependent variable of these equations being the log of the odds of the *k*-th alternative compared to the base alternative:

$$
\ln\left(\frac{P_{kit}}{P_{bit}}\right)
$$

where: P_{kit} = the probability of the *i*th issue in year *t* to have status corresponding to the k-th alternative

P_{bit} = the probability of the *i*th issue in year *t* to have status corresponding to the base alternative.

[10] Outstanding if t<N or matures if t=N when N is the year of scheduled maturity of the bond.

To estimate our multinomial logit model we use maximum likelihood estimation. The error terms, ε, are adjusted for clustering. Our regression equations are:

$$\ln\left(\frac{P_{rit}}{P_{0it}}\right) = \alpha_0 + \alpha_1 BP_{it-1} + \alpha_2 NRV_{it-1} + \alpha_3 Tres_t + \alpha_4 RealDebt_{it} + \alpha_5 Dummy95_t + \alpha_6 AgeDummy3\_5_{it} + \alpha_7 AgeDummy6\_10_{it} + \alpha_8 AgeDummy11\_15_{it} + \varepsilon_{rit}$$

$$\ln\left(\frac{P_{dit}}{P_{0it}}\right) = \gamma_0 + \gamma_1 BP_{it-1} + \gamma_2 NRV_{it-1} + \gamma_3 Tres_t + \gamma_4 RealDebt_{it} + \gamma_5 Dummy95_t + \gamma_6 AgeDummy3\_5_{it} + \gamma_7 AgeDummy6\_10_{it} + \gamma_8 AgeDummy11\_15_{it} + \varepsilon_{dit}$$

,where r = redeemed, d = defaulted, and o = "normal"(outstanding or matured), and where:

BP_{it-1}	=	Building permit issuance for the county of the local government with bond issue *i* lagged by one year
NRV_{it-1}	=	Non-residential valuation in 1990-year dollars for the county of the local government with bond issue *i* lagged by one year
$Tres_t$	=	The 10-year Treasury rate in year *t*
$RealDebt_{it}$	=	Total long-term debt outstanding for the county of the local government with bond issue *i* in year *t* expressed in 1990-year dollars
$Dummy95_t$	=	Dummy variable equal to one for all years 1995 and greater but only for bonds issued after July 1, 1995; reflects a structural change (the 1995 federal law enforcing annual disclosure reports from all issuers of Mello-Roos bonds issued after July 1, 1995)
$AgeDummy_{it}$	=	A set of age dummies that equal one if the respective bond is in the indicated age group.

The bonds' age pattern is highly non-linear (as we demonstrate in Figure II and Figure III later in our essay). Therefore, if we were to include their age as an explanatory variable in our model, we would not be able to capture that non-linearity. An alternative way would be to use a set of age dummy variables for the years since each bond was issued in our regressions. This will help better capture the effect of age on the status of the bonds[11]. However, due to the specific nature of our data, including age dummies for each bond age would limit the degrees of freedom in our model and the log of the likelihood ratios would be poorly defined. Keeping that in mind, we have captured the shape of the age dependence by creating a set of age dummies for bonds of specific age groups. This results in higher degrees of freedom and a better fitted model that reflects the existing non-linear dependence of age for bond redemptions and defaults.

4.2 Choice of Explanatory Variables

4.2.1 Credit Quality

In their August 1999 study, Keenan, Sobehart, and Hamilton recognized, like many authors before them have done, that since Fons (1991), most forecasting models and statistical studies of default have utilized corporate bond ratings as indicators of the overall credit quality of the bond issuers. The bonds in our study, however, are non-rated, and thus ratings are not available as a means of measuring credit quality for the issues in our sample. Furthermore, non-rated Mello-Roos bonds are quite different from high yield corporate bonds (which were the subject of most previous default research). This is the case for a number of reasons. First, a greater percentage of "junk" bonds represent unsecured obligations, while CFD bonds are secured by special tax revenues on the

[11] In addition, including years remaining until maturity as an explanatory variable might also be considered but all bonds in our sample have the same length at issue (i.e., they are all 30-year bonds), so including that additional explanatory variable will not add anything to our set of age dummies.

property for which such bonds are being issued. Thus, Mello-Roos bonds are liens on the property, not a personal obligation of the borrower, while high yield “junk” bonds are personal obligations and are typically unsecured, which implies that for the same obligor, “junk” bonds are riskier than Mello-Roos bonds. Assuming the efficient market hypothesis holds, the market understands this and prices it accordingly.

Calculating the yield spread between CFD bonds and treasuries might be one alternative way of measuring credit quality but information on the average yields of non-rated CFD bonds is very hard to obtain due to the specific nature of these bonds and the fact that each CFD bond issue reflects the unique credit of the project it is financing. Given that, the municipal market has established a special set of criteria to help assess the credit quality of each non-rated CFD bond issue. These include, among others, the value-to-lien, status of development, and diversification of ownership at the time of bond issuance. We believe that these characteristics of a CFD bond issue will have a strong explanatory power and be an important factor in assessing the risk of default. However, historical data on these criteria cannot be obtained for all CFD bonds issued, especially given the fact that such information is only available (and is included in the offering document with which the bonds are marketed) at the time of bond issuance, and is not tracked afterwards[12]. With all that in mind, we did not account explicitly for credit quality in our study. Utilizing the individual characteristics we identified above as a proxy of credit quality can be one way of expanding our analysis in the future, provided that such data can be obtained.

[12] Ownership information might be available from the assessor’s office but an appraisal of the property by a qualified appraiser is necessary to determine status of development and value-to-debt burden.

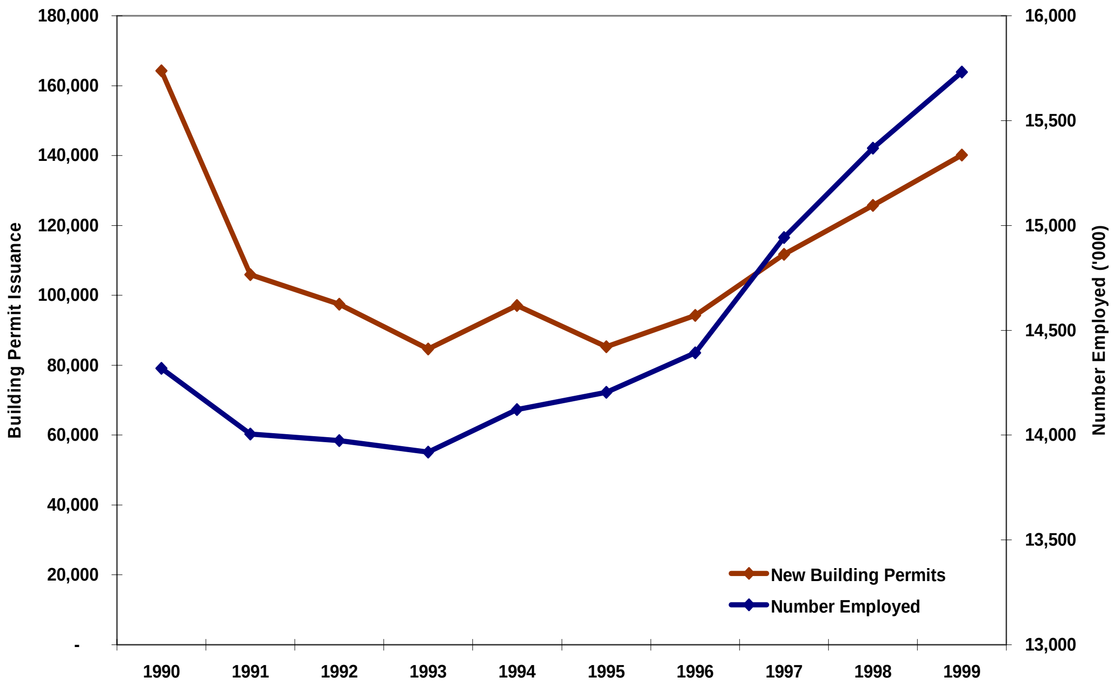
4.2.2 Macroeconomic Factors

Previous default studies show that there is a strong relationship between the state of the economy and the default occurrence and performance of high yield bonds. For example, in their "Municipal Default Risk Revisited" report, Litvack and McDermott demonstrate that there is a correlation between the percentage change in GDP and the annual dollar volume of defaults, with a one-year lag resulting in an even stronger correlation. The authors further argue that "municipal defaults appear to be lagging economic indicators," a result observed by Altman and Arman (2001), who examined the interdependency between defaults and economic recessions and found that in most of the cases, peaks in default rates were observed at the end of the recession or soon thereafter. The same holds true for non-rated CFD bonds, whose performance, as we showed in our first, and further explained in our second, essay, tends to lag the market due to their built-in reserve funds, capitalized interest accounts and other liquidity sources. Given their specific nature, non-rated Mello-Roos bonds are lagging indicators of the real estate market, a fact we have considered in determining the explanatory variables we use in our model.

Economic activity, and especially, the performance of the real estate market, has a significant impact on the performance of the non-rated CFD bonds. As we demonstrated in our first essay, a strong economy and rapid development, measured by high residential building permit issuance and low unemployment, are typically associated with strong issuance of land secured bonds and lower default risk. As proxies of the macroeconomic effects that are more closely tied to the specific nature of the non-rated land-secured market in California, we use new residential building permit issuance lagged by one year, total non-residential valuation lagged by one year[13], and the 10-year Treasury rate, which we anticipate to be significant for the change in the status of a non-rated CFD bond from outstanding to defaulted or redeemed. The use of the 10-year Treasury rate is justified, since when that rate increases, higher costs are realized (thus, higher likelihood of financial problems) and other investments become more attractive. When the 10-year Treasury is high, redeeming outstanding bonds might not make economic sense, since it might not result in sufficient savings to make the bond call worthwhile. We also considered utilizing employment as an explanatory variable in our model but due to its multicollinearity with building permit issuance (as illustrated in Figure I below and Figure IV in our first essay)[14], decided against it.

[13] Total non-residential valuation will be a good proxy for those CFD issues associated with commercial or industrial development.
[14] When building permit issuance is strong, employment is strong too.

Figure I: New Building Permit Issuance vs. Annual Employment in California (1990-1997)



An additional factor we have incorporated in our model is the indebtedness of the local governments issuing CFD bonds as represented by their total long-term debt outstanding in every year, which we have adjusted for inflation and calculated in real 1990-year dollars. It might be argued that this variable needs to be included in our regression equation because of the weak correlation that might exist between general obligation debt and CFD defaults due to the link to *ad valorem* tax rates. However, we do not expect that variable to be statistically significant for a number of reasons. First, due to Proposition 13 in the State of California, property tax rates are limited to 1%[15]. Furthermore, most general obligation (GO) bonds require two-thirds voter approval, and the outstanding amount of GO bonds is nominal in the state of California. In addition, most California

[15] For a detailed discussion, please refer to our first essay.

local governments' goals and policies and bond market criteria limit total special and *ad valorem* taxes to 2%, while property taxes in other states may reach 6%-7%. Besides, the long-term debt outstanding[16] is comprised of various types of debt (not only GO debt), most of which is also rated. Consequently, keeping all that in mind and recognizing the fact that Mello-Roos bonds are not obligations of the issuer but are secured by the liens on the property for which they are issued, we do not anticipate total long-term debt outstanding to be statistically significant when we estimate our model but for completeness and to check the possibility, have included it in our analysis.

4.2.3 The "Aging" Effect

The "aging" effect, as described in many studies[17], reflects the time that elapses between a bond's issuance and its default and is an important factor in explaining the likelihood of default occurrence of high yield corporate bonds. All previous research has demonstrated that defaults of low-rated bonds occur with a lag, namely that such bonds are less likely to default in the first year after they are issued and are most likely to default three years after issuance[18]. Altman and Arman (2001) argue that "bonds that default early in an issuer's "life" show a weakness in the initial credit quality and standards used to assess the security." They show that the percentage of defaults observed in the first three years after issuance for their entire sample period 1989-2001, was 53% of all defaults observed in that period, and that if we add to that fourth year defaults, the percentage increases to 69%. Following Altman and Arman (2001), we examine the default distribution by age of

16 As presented by the Census of Local Governments.
17 Such as Altman (1993), Jonsson and Fridson (1996) and others.
18 Altman and Kishore (1995).

the bonds for our non-rated Mello-Roos bonds by year of default. The results are presented in Table 1 below.

Table 1: Distribution of Years to Default from Original Issuance Date (1988-2001)

Years to Default	1988 No. of Issues	1988 % of Total	1989 No. of Issues	1989 % of Total	1990 No. of Issues	1990 % of Total	1991 No. of Issues	1991 % of Total	1992 No. of Issues	1992 % of Total	1993 No. of Issues	1993 % of Total	1994 No. of Issues	1994 % of Total	1995 No. of Issues	1995 % of Total
1	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	0	0%	0	0%
3	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	3	50%	0	0%
4	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	17%	1	100%
5	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	17%	0	0%
6	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	17%	0	0%
7	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
8	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
9	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
10	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Total	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	6	100%	1	100%

	1996		1997		1998		1999		2000		2001		1988-2001		1990-1997	
1	2	40%	0	0%	0	0%	0	0%	0	0%	0	0%	2	8%	2	10%
2	0	0%	1	13%	0	0%	0	0%	0	0%	0	0%	2	8%	2	10%
3	0	0%	0	0%	2	100%	0	0%	0	0%	0	0%	5	19%	3	14%
4	1	20%	1	13%	0	0%	0	0%	0	0%	0	0%	4	15%	4	19%
5	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	4%	1	5%
6	2	40%	3	38%	0	0%	0	0%	0	0%	0	0%	6	23%	6	29%
7	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
8	0	0%	1	13%	0	0%	0	0%	1	50%	0	0%	2	8%	1	5%
9	0	0%	2	25%	0	0%	0	0%	1	50%	0	0%	3	12%	2	10%
10	0	0%	0	0%	0	0%	1	100%	0	0%	0	0%	1	4%	0	0%
Total	5	100%	8	100%	2	100%	1	100%	2	100%	0	0%	26	100%	21	100%

As can be seen from Table 1, for the entire period 1988-2001, only 35% of the non-rated Mello-Roos bonds that defaulted did so in the first three years of their "life". If we consider our restricted sample (1990-1997), that result is 34%.

The age distribution of default is further illustrated in Figure II that shows three peaks of the non-rated CFD bond defaults, the highest one of which occurs in the sixth year after issuance for both the entire period 1988-2001, as well as for the period 1990-1997[19].

The first peak in Figure II is inherent to the bonds in our sample. Similarly to the defaults of low-rated bonds, defaults of non-rated CFD bonds occur with a lag. Existing debt service reserve funds, capitalized interest accounts and other sources of liquidity that we described in greater detail in our first essay serve as a cushion that delays the actual default of bonds that would have otherwise defaulted in the first year after being issued. Such defaults correspond to the vulnerability of real estate development associated with financial failures due to thin or insufficient capital. The non-economic use of capital leads to negative cash flows that serve as the primary stressor inducing default.

The second peak, occurring in the sixth year after issuance, is an artifact from a random issuance pattern combined with macroeconomic effects. In planning their undertaking, most developers measure the absorption of their projects from the time they receive certificates of occupancy instead of the time the bonds secured by the land in those projects are issued. Within six years of the issuance of the bonds, however, entitlements are obtained, development plans are usually completed, models are well underway, and the product is being absorbed. It is then though that a sudden significant change in any of the economic drivers of real estate development, such as price points, employment,

[19] Figure II illustrates the age distribution of defaults over a longer time span (1988-2001) than the 1990-1997 period we analyze in our paper. As we mentioned earlier, we have default data for that longer period of time but do not have all necessary information to allow us to use it in our regression analysis. That is why our multinomial logit model considers only the restricted sample (1990-1997).

demand, absorption, etc., has a detrimental impact on the project and ultimately leads to the default of the bond issue.

Similar is the reasoning behind the third peak observed in Figure II, which occurs in the ninth year after issuance. By that time, project absorption is usually well underway, houses are being sold and escrows closed and it is only an economic downturn or a significant change in the macroeconomic environment that causes a stall in the development and prevents it from occurring as planned. That results in the developers' inability to continue paying special taxes, which ultimately leads to default.

Figure II: The Age Distribution of Defaults

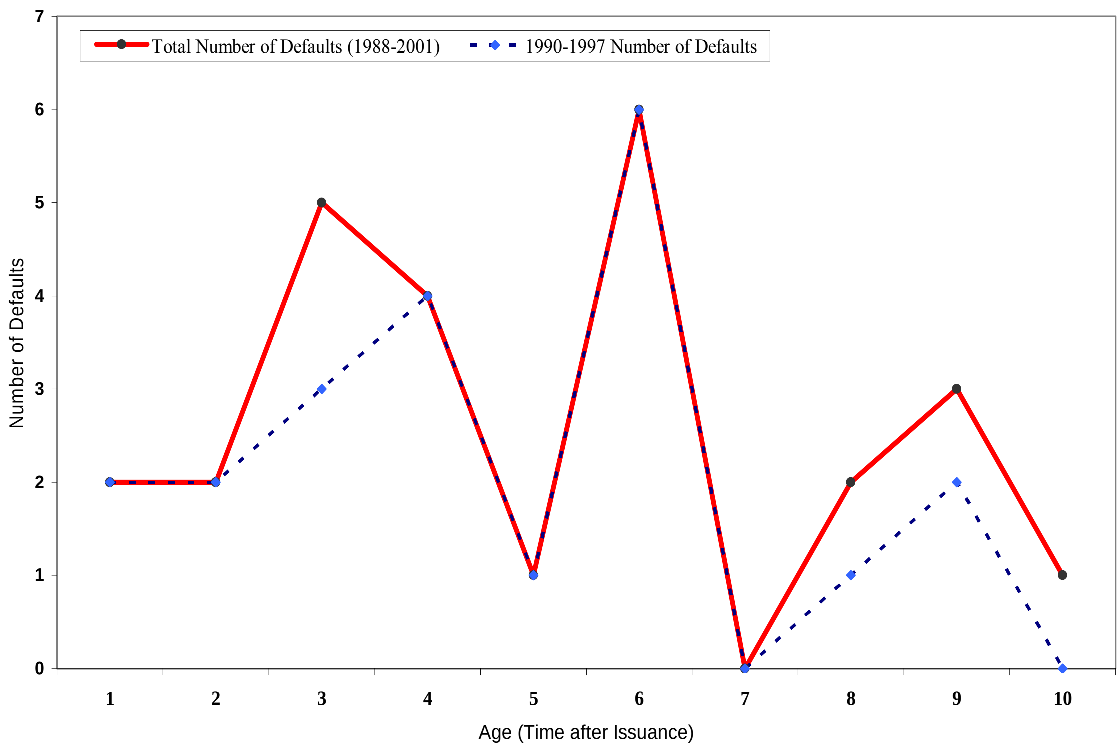


Figure II demonstrates that, just like for high yield corporate bonds, defaults of non-rated CFD bonds occur with a lag, but that lag is often greater than the one for "junk" bonds, and the age pattern of non-rated Mello-Roos defaults appears to be quite different from the one for low-rated corporate bonds.

The age factor will also be important when analyzing the potential change in status of a non-rated CFD bond from "normal" to redeemed[20]. Figure III compares the age distribution of defaulted and redeemed bonds. In the earlier to mid years after the passage of the Mello-Roos Community Facilities Act in California in 1982, most CFD bonds had 10-year call protection, which precluded redemption in the first ten years after issuance. In later years, call redemption provisions became more flexible[21], allowing bond calls five to six years after issuance[22]. Consequently, we would expect that there will be a positive correlation between the age of bonds that are six to ten years old and their likelihood of redemption.

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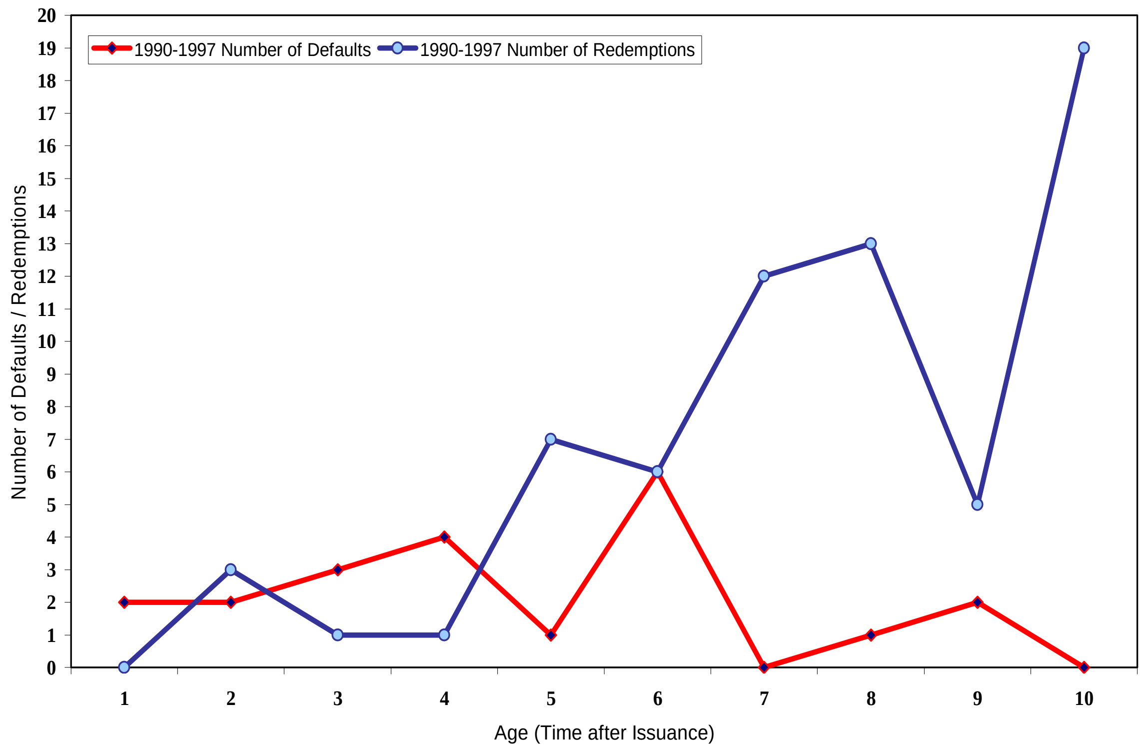
[20] Age matters because the bonds of a CFD that experiences strong development during the first few years after issuance are more likely to be redeemed with the new bonds bearing lower interest rates, which are passed on to the property owners. In contrast, a CFD that does not progress much in development during the first few years becomes a more likely candidate for default, especially if there are adverse economic changes.

[21] As can be seen from Figure III, less than 6% of all redeemed bonds were called in the first three years after they were issued and only 7.38% of all redeemed bonds were redeemed in the first four years of their issuance date, with significantly more redemptions for bonds of ages five and six.

[22] Currently, for many non-rated Mello-Roos issues, even shorter call provisions can be observed, allowing the redemption of bonds at a premium as early as one year from their issuance, if economically feasible.

Figure III: The Age Distribution of Defaults and Redemptions



5 Empirical Results

As previously described, the data we use is panel data, which contains information on the status of a sample of non-rated CFD bonds for the years 1990 to 1997. The three possible outcomes are "normal" (*status* = 0), redeemed (*status* = 1), and defaulted (*status* = 2). The base category is "normal". Out of 2,985 observations, 2,897 belong to the base category (i.e. are either outstanding or matured), 67 are redeemed, and 21 have defaulted. The explanatory variables are as we explained earlier various macroeconomic, financial, and policy-related factors, as well as age dummies to capture the age effect for bonds of various age groups. The results are given in Table 2[23].

As expected, the likelihood of redeeming a bond depends on its age. Bonds that have been outstanding for six to ten years are more likely to be redeemed. There is a positive correlation between a bond of such age and the log-odds ratio between the bond being redeemed and the bond remaining in its base status. The age dummy variable for bonds of that age group is statistically significant at the 5% confidence level. As can be seen from Table 2, there is a positive correlation between bonds that have been outstanding for three to five years and the log-likelihood ratio for those bonds to be redeemed, which is supported by our observation of the market allowing bond calls starting as early as the third year after issuance. However, the coefficient for the age dummy corresponding to that age group is not statistically significant. That might be due to the fact that very few bond issues of that age were actually redeemed. If a bond has been outstanding for more than 10 years, however, it is less likely that it will be redeemed. As expected, the 10-year Treasury rate is significant in this case as well. Its coefficient is negative, which implies that a higher 10-year Treasury rate leads to a lower likelihood of an outstanding bond to be redeemed. This result is justified, since in a higher interest rate environment, it might not be economically feasible to redeem an outstanding bond. As far as the real debt variable is concerned, as discussed earlier, we anticipated that it will not be statistically significant and that is indeed the case as illustrated in Table 2.

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[23] Table 2 presents the estimated coefficients of the independent variables from our multinomial logit model, with their standard errors, which have been adjusted for clustering, listed in parentheticals.

Most of the age dummies are significant in the second case with the exception of the age dummy variable for three- to five-year-old bonds. Their coefficient has the expected positive sign but is not statistically significant. Given the default distribution of the bonds we are examining, it is not surprising that this age dummy is not statistically meaningful for the change in the status of a bond from "normal" to defaulted. As can be seen from the results in Table 2, there is a positive correlation between six- to ten-year-old bonds and the log odds of those bonds changing their status from outstanding to defaulting. Since bond defaults in principal do not occur late in the life of a bond[24], it is not surprising that the coefficient of the age dummy corresponding to bonds older than ten years has the expected negative sign. Total long-term debt outstanding is not significant again, just as we expected for the reasons we discussed earlier.

Macroeconomic factors, such as residential building permit issuance and non-residential valuation also play a role in explaining the likelihood of default. A one-unit increase in residential building permit issuance reduces the log-odds between a bond being outstanding and defaulting by -.0002. Since the magnitudes of the coefficients are difficult to interpret, it might be more helpful to see what the percentage change in the odds ratio between a bond defaulting and remaining in its "normal" status will be if the lagged residential building permits issuance were to increase by one standard deviation compared to its mean. If the lagged residential building permit issuance were to increase by one standard deviation compared to its mean, the odds of defaulting as compared to the base case would decrease by 60.5%. In a similar vein, given the fact that the 10-year

[24] Since by then projects (funded through the issuance of such bonds) are usually well underway, building construction is nearly complete, there is greater diversification of ownership and higher value-to-debt ratio and thus lower risk of default.

treasury rate is significant for the redemption of bonds, if the 10-year treasury rate were to increase by one standard deviation as compared to its mean, the odds ratio between redemption as compared to the base case would decrease by 71%. These results support our expectation, as well as results from prior studies, that the state of the economy is a major determinant of how a bond performs and what status it is in.

From Table 2 we can also see that the dummy variable we introduced to reflect the structural change of the federal requirement imposed in 1995 is statistically significant for the change in bond status from outstanding to redeemed, demonstrating a negative impact of the annual reporting requirement on bonds issued after July 1, 1995, and not significant for the default – no default case. However, given the fact that we only study bonds that were outstanding from 1990 to 1997, the total impact of this policy variable might not be fully captured by our data set.

Table 2: Multinomial Logit Estimates of Non-Rated Mello-Roos Bonds Status

Dependent Variable: status

Explanatory Variable	*redeemed (status = 1)*	*defaulted (status = 2)*
BP_{t-1}	-.0000	-.0002*
	(.0001)	(.0001)
NRV_{t-1}	-3.86e-10	6.43e-10*
	(5.54e-10)	(3.20e-10)
Treas	-173.5195*	49.4150
	(43.1152)	(43.2943)
RealDebt	1.43e-07	1.95e-07
	(1.92e-07)	(2.08e-07)
Dummy95	-31.6369*	.5076
	(.5855)	(1.2007)
AgeDummy3_5	.4477	.4828
	(.6662)	(.6989)
AgeDummy6-10	2.6756*	1.1946**
	(.5877)	(.7035)
AgeDummy11-15	-31.4559*	-32.1498*
	(.7485)	(.8931)
constant	6.2690*	-7.8937*
	(2.9410)	(3.1259)
Number of Observations	2,414	
Log-likelihood value	-365.1243	
Pseudo R-squared	.1432	

*Note: * Statistically significant at the 5% confidence level.*
*** Statistically significant at the 10% confidence level.*
Standard errors adjusted for clustering (listed in parantheticals).

6 Conclusion

Our study has extended the research on the determinants of default occurrence among high yield corporate bonds to account for a specific sub-set of municipal bonds, the non-rated Mello-Roos bonds in California. We have refined the variables included in previous studies to reflect the specific nature of the non-rated CFD bonds and have used multinomial logit analysis to identify those variables which determine whether a bond is redeemed, has defaulted, or has matured or remains outstanding in the municipal market. The results we obtain suggest that the key determinants in the change of the status of a CFD bond from “normal” to redeemed are the 10-year treasury rate and the age of the bond, while the change in status from “normal” to defaulted is impacted by the lagged performance of the real estate market (measured by the total number of new residential building permits issued lagged one year and total non-residential valuation lagged by one year) and the age of the bond.

Our study confirms that a weaker economy, as measured by decreasing number of building permits issued, is more likely to lead to more defaults among outstanding non-rated Mello-Roos bonds. It further demonstrates that bonds do not default in their late years and very few bonds default in their early years. The major part of all redemptions occur for bonds between the ages six to ten and the 10-year treasury plays an important role in explaining the change in the status of a non-rated CFD bond from “normal” to redeemed but is not statistically significant in explaining the change in the status of a bond from “normal” to defaulted.

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